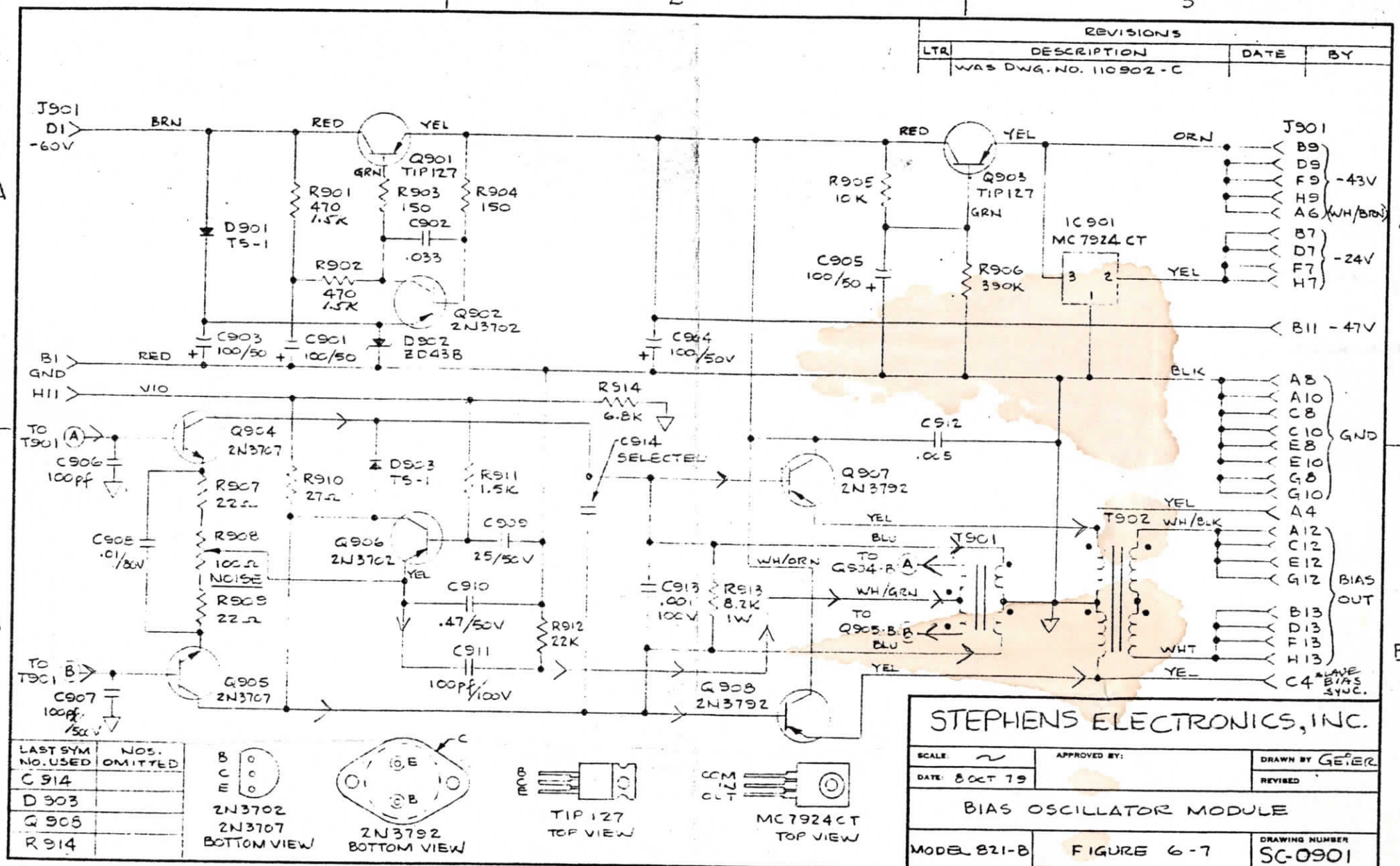


A

B



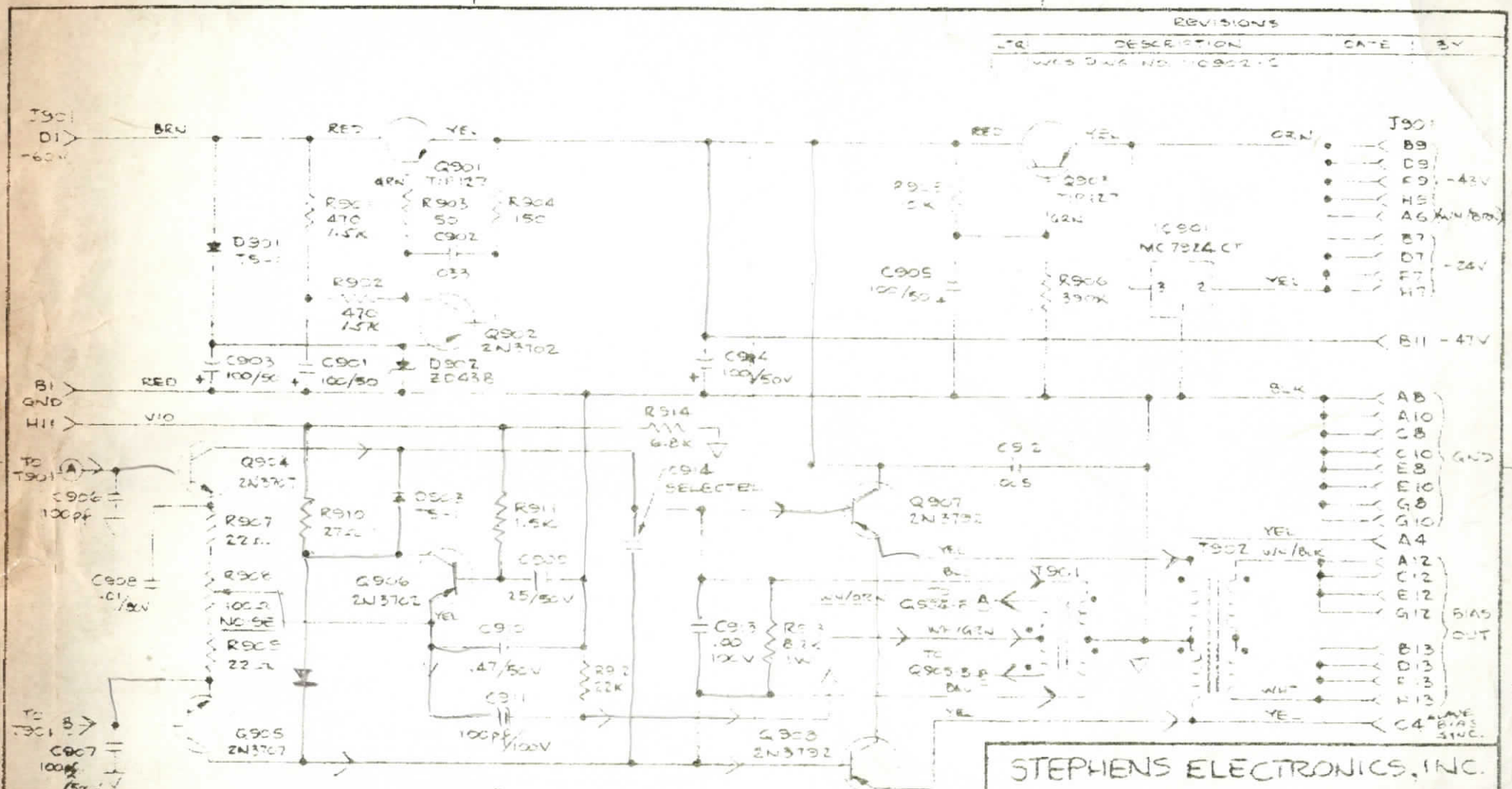
2

3

1

2

3



STEPHENS ELECTRONICS, INC.		
SCALE	APPROVED BY	DRAWN BY G.E.R.
DATE 8 OCT 79		REVISED
BIAS OSCILLATOR MODULE		
MODEL 821-B	FIGURE 6-7	DRAWING NUMBER SC-0901

B

B

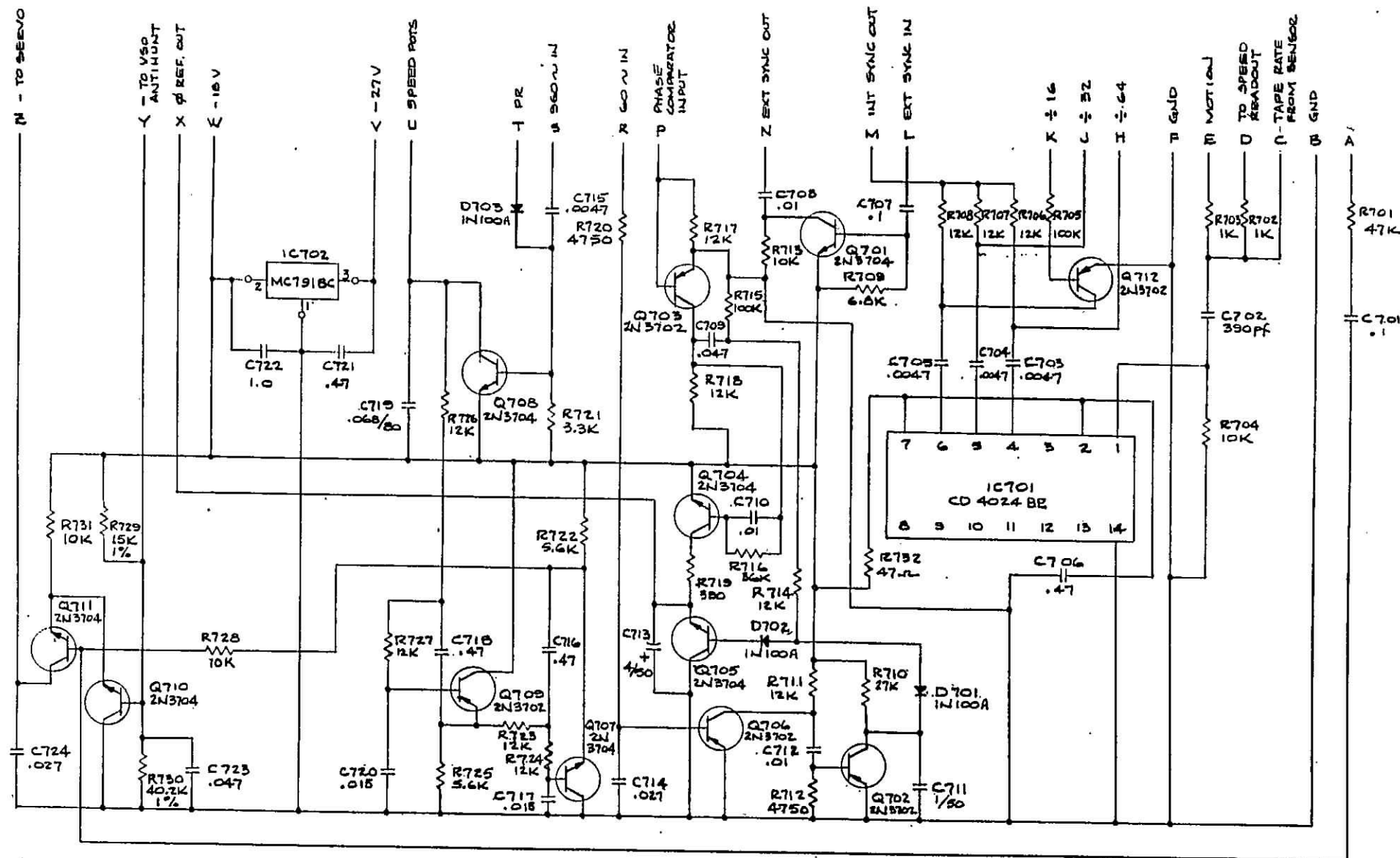
A

A

1

2

3



ALL CAPACITORS 50 VOLT AND IN MICROFARADS
ALL RESISTOR 1/4 WATT

STEPHENS ELECTRONICS, INC.

SCALE: APPROVER BY: DRAWN BY: GIER
DATE: 17 APR 78 REVISED: 8-28-80

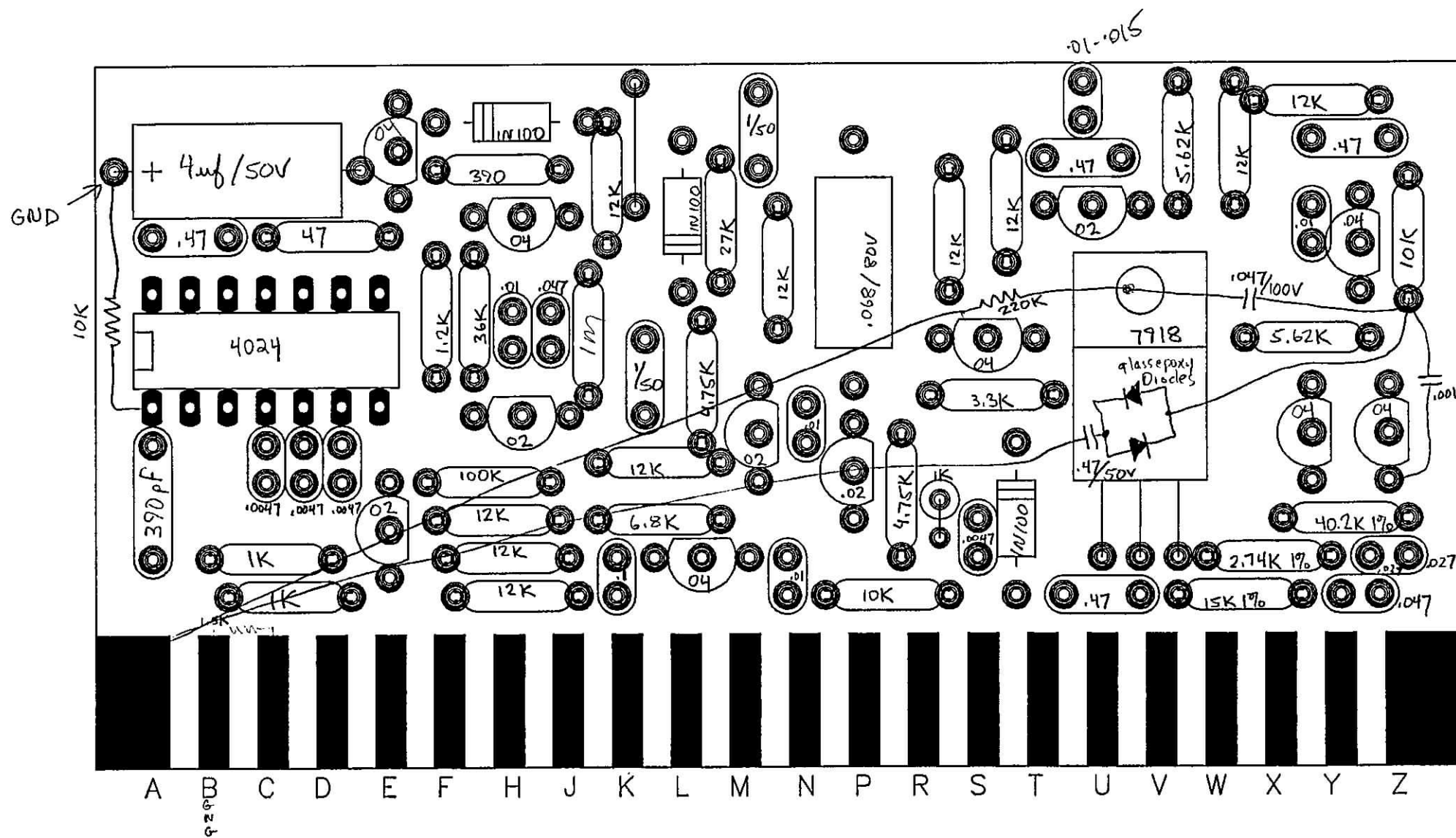
SCHEMATIC
CONVERTER CARD - 310164.A

MODELS 103A-104A FIGURE 6-11 DRAWING NUMBER

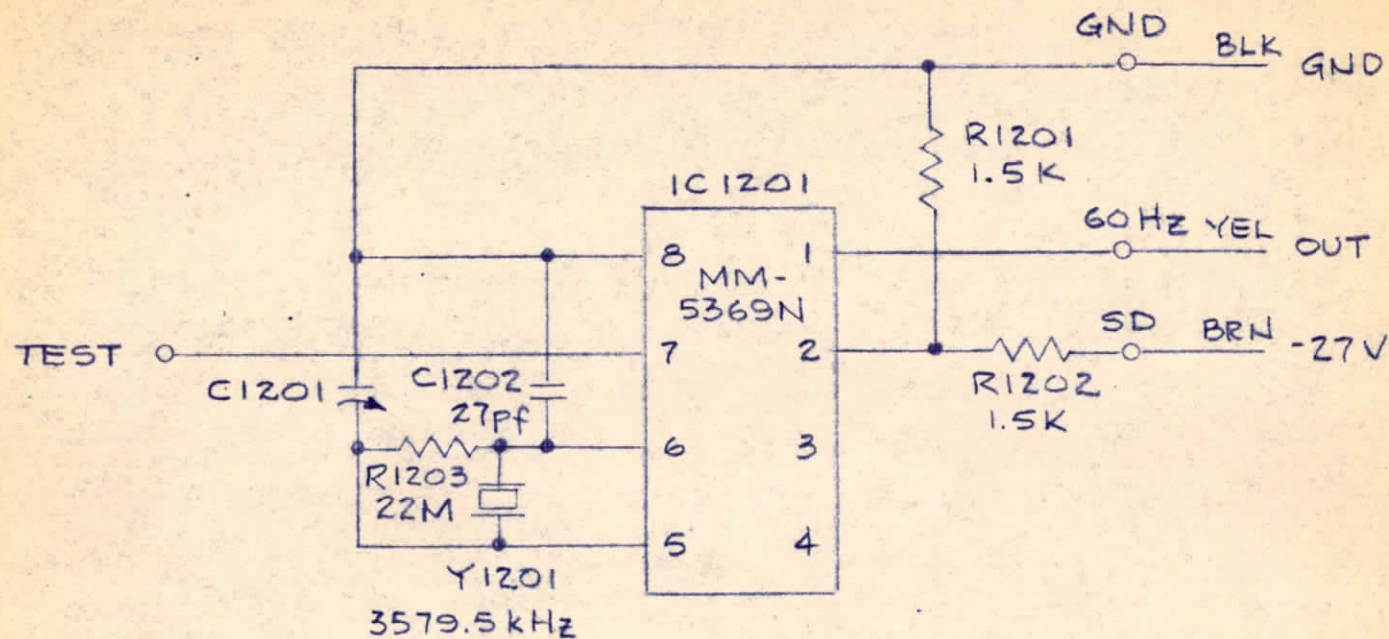
101-026



CONVERTER



REVISIONS			
LTR	DESCRIPTION	DATE	BY



THIS SCHEMATIC APPLIES TO MACHINES
UP TO AND INCLUDING SN 1064

STEPHENS ELECTRONICS, INC.

SCALE: ~

APPROVED BY:

DRAWN BY GEIER

DATE: 19 SEP 79

REVISED

CRYSTAL FREQUENCY CONTROL CARD

MODEL 821-B

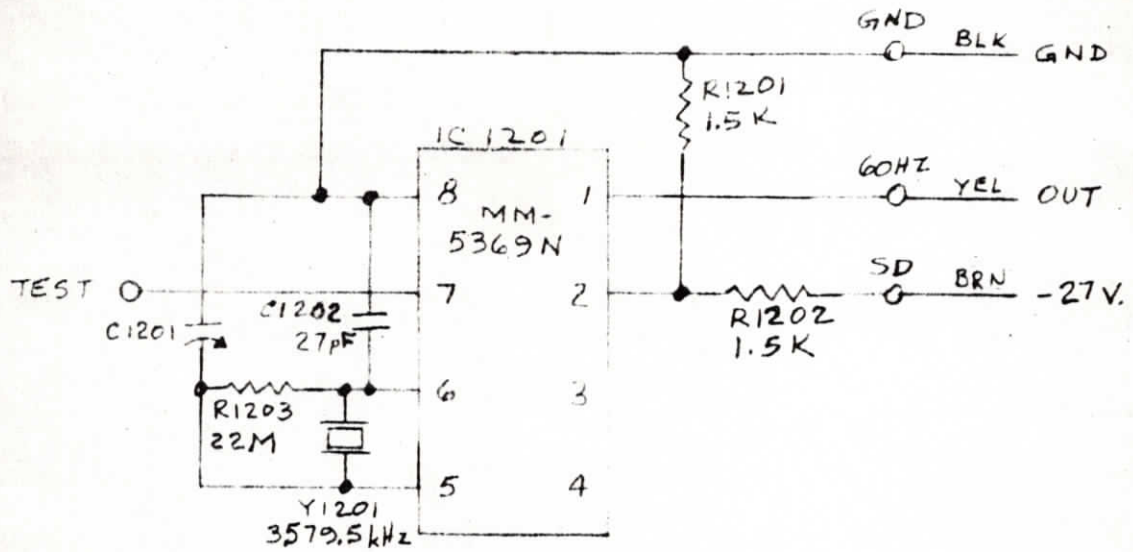
FIGURE 6-13

DRAWING NUMBER REV.

SC-1201

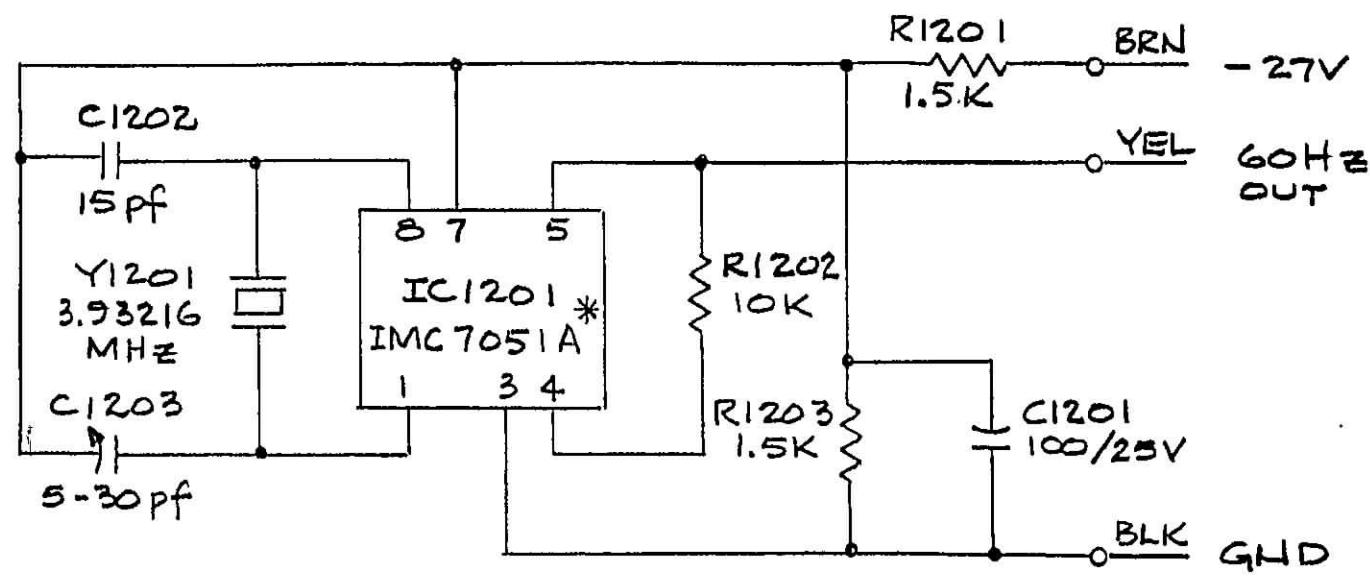
FIGURE 6-13

REVISED 3/19/79



SCHEMATIC, CRYSTAL FREQUENCY CONTROL CARD


REVISIONS:			
LTR	DESCRIPTION	DATE	BY



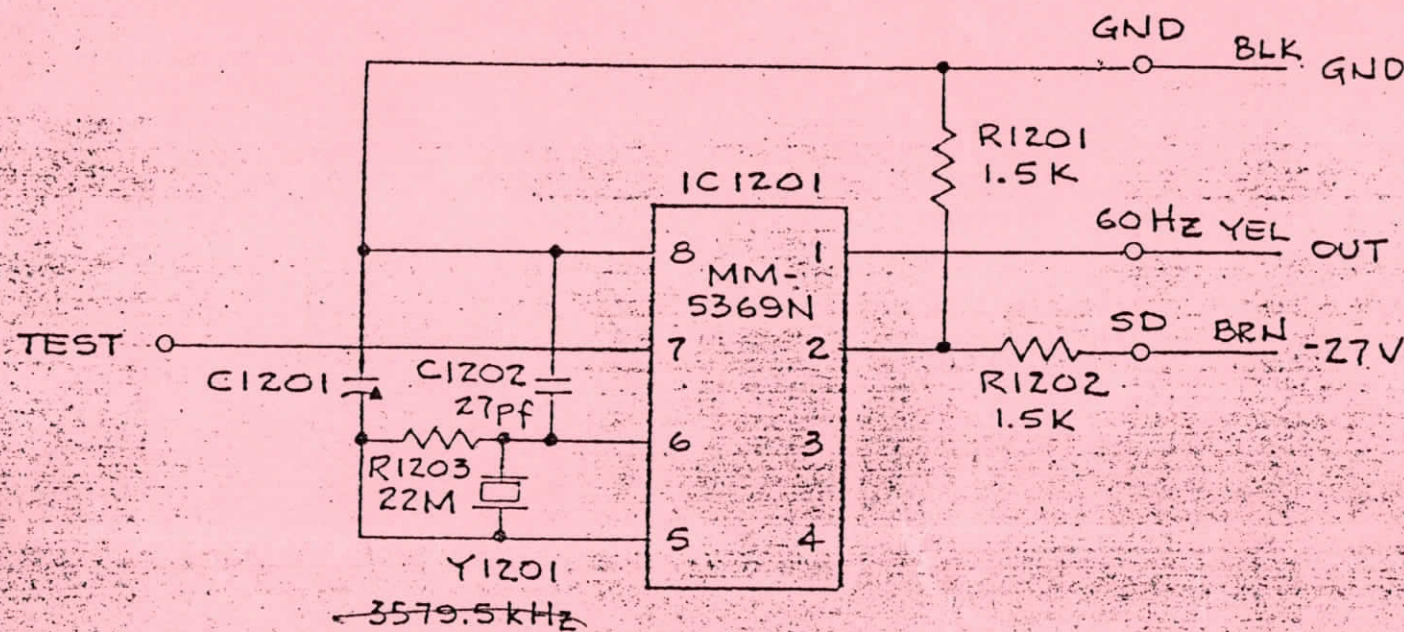
* ALTERNATE : ITS 9042-1

USED ON SN 1065 AND UP

FIGURE 6-13

STEPHENS ELECTRONICS, INC.		
SCALE: 	APPROVED BY:	DRAWN BY GEIER
DATE: 20 OCT 79		REVISED
CRYSTAL FREQUENCY CONTROL CARD		
MODEL 821-B	FIGURE 6-13	DRAWING NUMBER SC-1202

REVISIONS			
LTR	DESCRIPTION	DATE	BY



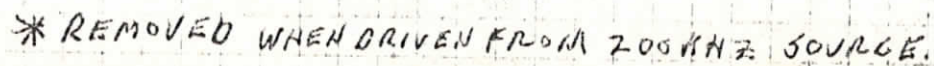
3,579.5 MHz XTAL

Handwritten notes:
 92
 This helps
 Bob

STEPHENS ELECTRONICS, INC.		
SCALE: ~	APPROVED BY:	DRAWN BY GEIER
DATE: 19 SEP 79		REVISED:
CRYSTAL FREQUENCY CONTROL CARD		
MODEL 821-B	FIGURE 6-13	DRAWING NUMBER REV. SC1201

FIGURE 6-13

9-25-77



4.6 THEORY OF OPERATION

4.6.1 GENERAL

4.6.1.1

The theory of operation is presented primarily as an aid to the analysis of any malfunction which might occur. The overall control system is rather complex, and it would be impossible to list all possible faults and their symptoms. However, a thorough understanding of how the system works will help in pinpointing a problem and in establishing its correction.

This section is sub-divided into three parts, covering:

- (1) the tape motion control system
- (2) the multiplex system for presetting the record and monitor conditions
- (3) the recording and reproducing audio electronics

4.6.1.2

To attempt to trace a signal through the system by means of the individual schematics and wiring diagrams is complicated and time consuming. For this reason, several "system" type schematics have been included in the manual to simplify that process. While these system schematics duplicate the information in the other diagrams, they combine it in such a way that they are useful also for trouble-shooting. However, during actual maintenance or repairs of the equipment, the individual schematics and parts lists should also be consulted to assure your having completely up-to-date parts information.

When using the system schematics (particularly the tape control system), several things should be kept in mind. First of all, where diodes are shown without type numbers, they are all type 1N100 germanium diodes. These diodes are characterized by a lower forward voltage drop (approx. 0.3 volts) than for silicon diodes. (Incidentally, the maximum temperature that germanium devices can tolerate is substantially lower than for silicon devices, and they must be treated accordingly.) The second thing to remember is that the undesignated transistors are 2N3702 or 2N3704, depending on whether they are PNP or NPN respectively. Third, the TIP121 and TIP127 transistors used in several places are Darlington-connected power transistors, with a Beta of the order of 1000. Since each one is actually two transistors in series, the forward base-to-emitter voltage drop is about twice that of conventional transistors.

4.6.2 TAPE MOTION CONTROL SYSTEM

The tape motion control system may be visualized in two parts:

- (1) the servo system with its speed control for governing the tape motion at recording and reproducing tape speeds of 15 IPS, 30 IPS, and 60 IPS
- (2) the logic system which inhibits the speed control and substitutes its own signals to the motors for all other

With only minor exceptions, these are separate unrelated functions, and can be treated separately here.

An examination of the Tape Control System Schematic, Figure 6-1, shows a "phantom" line separating the upper and lower halves of the diagram. The circuitry below the phantom line is essentially logic type ("on" or "off") circuits, used to determine the mode of tape motion, to start, stop and reverse the tape, and to automatically control the associated switching in the bias oscillator, preamps, line amps and power supply.

These two main functions are relatively independent of each other, as explained later, and the phantom line will help the reader to visualize them separately.

4.6.2.1 SERVO SYSTEM

In this description, we shall first examine the servo system, including the all important phase-lock feature, operating as it would in "play" mode. Figure 4-X is a block diagram of the entire servo system except for the "variable" speed mode.

Tape speed is sensed through the idler located in front of the head stack, around which the tape passes. The idler rotates on bearings having extremely low friction, and tape slippage on the idler is so low as to be virtually unmeasurable. Attached to the idler and rotating with it is a disc having alternate opaque and transparent lines precisely positioned around the disc (as spokes in a wheel). As the idler rotates, these lines "chop" the light traveling from a light source to a photo-transistor, resulting in a series of electrical pulses whose repetition rate (frequency) depends directly on tape speed. (Infra-red light sources and infra-red sensitive photo-transistors are used to avoid interference from outside sources.) There are 480 pulses per second at 15 IPS, or 32 pulses per inch of tape travel.

This transducer, together with pulse-shaping circuits, a frequency doubler and subsequent frequency dividers, constitute the IPS-to-frequency converter in the block diagram. The output frequency at correct tape speeds is always 60 Hz. For comparison with the tape speed pulses, there is a separate oscillator, as shown in the block diagram, crystal controlled for an accurate and very constant 60 Hz signal.

The 60 Hz signals from these two sources are then compared in the phase comparator, whose D.C. output depends on the phase relationship between the two signals. This D.C. voltage is applied to one input of a differential amplifier.

Simultaneously, the doubled frequency (960, 1920, or 3840 Hz, depending on assigned tape speed) is also fed to another converter (frequency-to-voltage converter in the block diagram) whose D.C. output voltage depends on tape speed. This output is fed to the other input of the differential amplifier. The D.C. output of the differential amplifier depends on the difference between these voltages, and is fed to the servo amplifiers driving the two reel

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motors.

Observe, in the block diagram, the inverting amplifier ahead of one of the servo amplifiers. This is provided so that as the voltage on one motor is increased to speed it up, the voltage to the other (opposing) motor is reduced, in order to aid the "speed-up" process and to keep tape tension down where it belongs.

This speed control process is described in detail in the following paragraphs. An overall control system schematic, Figure 6-1, located in Section 6.0: DIAGRAMS, should be referred to while following this detailed analysis.

4.6.2.2 IPS/FREQUENCY CONVERTER

In the upper left corner of the schematic (box marked "SENSOR AND PULSE GENERATOR") are shown the LED infra-red light source D1102 and D1103 and the associated infra-red sensitive photo-transistors Q1102 and Q1103. As described above, the rotating disc interrupts and restores the light directed at the photo-transistors, which are precisely positioned so that they are simultaneously excited. (They are also placed across the disc from each other to minimize the effect of any eccentricity of the disc.) The "chopped" light turns the photo-transistors Q1102 and Q1103 on and off, thus intermittently grounding the emitter of Q1104. The resulting approximately-square wave signal on Q1104's collector is further amplified and "squared" by Q1105 acting as a switch.

The third "chopped light" switch (D1101 and Q1101) and associated circuits are described later in paragraph 4.6.2.9: DIRECTION SENSE CIRCUIT.

The next part of this circuit, comprising Q1106, Q1107, and Q1108, is somewhat unconventional. If the disc is not turning, Q1105 will be "on" or "off", depending on where the disc stopped. In either case, capacitors C1102 and C1103 will be charged to their applied voltages, no D.C. current will flow, and Q1106 and Q1108 will be off (non-conducting). With no voltage across R1108, Q1110 is also off, and the voltage at TP1105 is zero (ground potential). The significance of this is explained later.

With the disc turning, charging current will be applied to the capacitors, in first one direction and then the other. Assume for the moment that the disc was stopped in a position to leave Q1105 cut off. The left side of C1102 will be at -18V., and the right side will be at about -3.9V. (The latter is as far negative as it could go while C1102 was charging, consisting of the forward diode voltage of Q1106 base-to-emitter plus the emitter voltage of -3.2V.) Now, when the disc starts turning, Q1105 suddenly turns "on", clamping the junction of R1106 and R1107 at -3.2V. charging current immediately flows thru R1107, C1102 and C1103. Most (99%) of the initial voltage change will take place across C1103 until, in a matter of microseconds, the voltage at the right side of C1102 will arrive at about -1.8V. (-3.2V. + the two .7 volt drops across the Q1107 and Q1108 base-to-emitter forward diode voltages). At this point, C1103 can charge no further, and only C1102 is now charging thru R1107. As the disc continues to turn, the switch Q1105 suddenly opens, -18 volts is applied thru R1106 and R1107, and the foregoing

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process reverses; C1103 re-charges to the -3.9 volt level where it is clamped by Q1106 base-to-emitter again, etc.

During the time that C1103 is charging in either direction (several microseconds), Q1106 and Q1108 are biased "off", as described earlier for the motionless disc. However, during the rest of the time, either Q1106 or Q1108 is conducting, turning Q1110 on thru R1109 and clamping TP1105 at -18V. Thus, during the short C1103 charging time, TP1105 is unclamped and allowed to swing positively to 0 volts, thus-forming a positive-going pulse from a -18 volt base line.

Since this phenomenon occurs when Q1105 is clamped and again when it is unclamped, the pulse frequency at TP1105 is twice that of the square wave from the light chopper.

As Q1107 is turned on and off (at the light chopper frequency), the resulting square wave voltage across R1110 is differentiated thru C1104 and R1111 and applied to the base of Q1109. The result is a series of positive-going pulses at chopper frequency, applied to IC1101. The rest of that circuit will be described as part of the logic circuit for stopping tape motion.

The doubled frequency pulses (TP1105) are applied to IC701 (shown in the next box, marked "COUNTER"), which is a frequency divider. Only three of the outputs of IC701 are used: divided by 16, divided by 32, and divided by 64. In operation, only one or two of these are used at a time; the other two (or one) will be inhibited by the "SCAN" and "30 IPS" switches (shown below the COUNTER box in the middle of the schematic), as described below.

When both "SCAN" and "30 IPS" switches are off, the divide by 32 and divide by 64 outputs are both inhibited by grounding the output capacitors C703 and C704, and only the divide by 16 goes through. This is a square wave from IC701 at one-sixteenth the input pulse frequency, or 60 Hz for 15 IPS. The positive voltage excursion is differentiated thru C705, R708, and R717 (in the PHASE COMPARATOR box). The negative excursion is differentiated thru C705, R708, and the base-to-emitter current in Q703, turning Q703 on briefly. Note that only the negative-going pulses are effective, the positive pulses serving only to bias Q703 farther "off".

When the "30 IPS" switch is on, the divide by 32 output is enabled (no longer grounded), and both divide by 16, and divide by 32 goes through. When the "30 IPS" switch is off, and the "SCAN" switch is on, the divide by 64 is enabled and the divide by 16 is now inhibited. (Note that this last operation is accomplished by applying -24 volts thru R705 to the base of Q712, clamping divide by 16 to ground.) With divide by 32 inhibited, only divide by 64 goes thru. When both "SCAN" and "30 IPS" switches are on, only divide by 16 is inhibited, and both divide by 32 and divide by 64 goes through. Table 4-X shows the output combinations enabled for the four switch combinations.

Insert Table 4-X (Frequency Divider Outputs) here

When two counter outputs are enabled at the same time, it does not result in confusion at the phase comparator, for the following reason. At the moment when the divide by 32 voltage is swinging

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either positive or negative the divide by 16 voltage is swinging negative. Thus, when the divide by 32 swings positive, it cancels the unwanted negative swing of the divide by 16 output, and no pulse results at the base of Q703. When the divide by 32 swings negative (where we want a pulse), the divide by 16 also swings negative, and actually enhances the negative pulse at the Q703 base. The same holds true with the divide by 64 and divide by 32 outputs where only the divide by 64 is desired.

4.6.2.3 PHASE COMPARATOR

The block directly below the COUNTER box on the schematic, entitled "60 HZ XTAL OSC", is shown in detail in its own schematic, Figure 6-X. It consists of a 3.579 megahertz crystal identical to those commonly used in color television receivers, and an IC which provides an oscillator circuit for the crystal and a frequency divider to "count down" from 3.579 MHz to 60 Hz. The output is essentially a square wave.

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The oscillator output is fed thru R720 (box marked PHASE COMPARATOR) to the base of Q706, turning Q706 on and off at a 60-Hz rate. The resulting square wave is differentiated thru C712 and R712. The negative pulse thus formed is applied to the base of Q702, turning it on for about 350 microseconds, and then turning it off until the next pulse which occurs about 16 milliseconds later. When Q702 is "on", C711 is clamped to ground and discharged. During the Q702 "off" period, C711 is charging thru R710 to about -8.5 volts, more or less linearly, at which time the cycle repeats itself. The resulting 60 Hz voltage "ramp" is applied to the D701 cathode.

While all this is happening, the pulses from the frequency divider (COUNTER) are being applied, also at essentially 60 Hz, to Q703, as described above in paragraph 4.6.2.2. Each negative pulse turns Q703 on for about 150 microseconds, clamping its collector to ground. During this period, Q704 is turned on thru R716, clamping one end of R719 to -18 volts. Simultaneously, C709, which has accumulated a negative charge during the Q703 "off" period, drives R704 in a positive direction sufficiently to draw current thru D701. This, of course, limits the positive voltage excursion of the R704/D701 junction, and this is the voltage applied thru D702 to the base of emitter-follower Q705. (Since the time constant of R704 and C711 is many times as great as the duration of the pulse, no appreciable change in voltage across C711 takes place.)

The voltage across C713 is established by the emitter follower during the pulse "on" time. If the C713 voltage is more negative than that applied by Q705, it is immediately discharged appropriately to a less negative voltage by Q705. On the other hand, if the C713 voltage is too low, Q705 will not even conduct until the capacitor has charged thru R719 and Q704 to the point where Q705 again conducts and limits any further charge. During the "off" period between pulses, both Q704 and Q705 are turned off, and the only discharge path for C713 is thru R2005 and R2004, which is negligible.

It can be seen from the foregoing description that Q703, Q704, and Q705 "sample" the instantaneous voltage across C711 at a time determined by the instantaneous position of the tape, and then "hold" that sample until time to sample it again. This constitutes a classical repetitive "sample-and-hold" application.

If successive pulses from the tape movement are later and later relative to the 60 Hz oscillator pulses, the sampled ramp voltages will be more and more negative, and it will be seen farther on in this description that the result is to bias the servo amplifiers in a direction to speed up the tape. Of course, the opposite is true if the tape motion is too fast.

The voltage divider comprising R2004 (VSO box) and the parallel combination of R729 and R730 (DIFFERENTIAL AMPLIFIER box) reduces the effect of the phase comparator to a small fraction of that of the primary speed control to be described below. In this way, the phase-lock control acts as a sort of "vernier" control over the basic speed control, as is explained in more detail later.

4.6.2.4 FREQUENCY-TO-VOLTAGE CONVERTER

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The pulses from the tape speed sensor are also fed to the frequency-to-voltage converter (box directly below PHASE COMPARATOR on schematic) thru R703 and C715. (During servo operation, -24 volts is applied thru R821 to D703, effectively disconnecting the diode.) These positive-going pulses turn on Q708 very briefly (a few microseconds), long enough to discharge C719. During the "off" period between pulses, C719 is being charged in a positive direction (toward ground potential) thru whichever speed pot and associated resistor has been selected by the "SCAN" and "30 IPS" switches. For example, with the switches "off" as shown on the schematic, 15 IPS is the selected speed, and C719 charges thru R401 and R404. The voltage to which C719 will charge depends (for a given total "speed pot" resistance, R404 plus variable R401) on the inter-pulse period, and will therefore decrease as the speed increases. Thus, the average voltage across C719 is inversely proportional to tape speed (approx.). The output waveform is a series of "sawtooth" voltage ramps, and therefore consists of a D.C. component and many A.C. harmonics of the pulse frequency. The two stage filter (LOW-PASS FILTER box) which follows the converter effectively eliminates the A.C. components of the signal, and pass only the D.C. voltage level.

A comprehensive analysis of the operation of this active low-pass filter is beyond the scope of this writing, and the interested reader is referred to the many published textbooks on the subject. It is sufficient for our purposes here to consider that the filter output is an essentially pure D.C. output proportional to the average of the sawtooth voltage applied at the filter input.

4.6.2.4 DIFFERENTIAL AMPLIFIER

The main characteristic of a differential amplifier is its response to the voltage difference applied to its two inputs. In the application described here (see DIFFERENTIAL AMPLIFIER box), the two inputs comes from the low-pass filter and from the phase comparator thru the VSO, respectively. The latter voltage, applied to Q710, is determined mainly by the voltage divider R729/R730, and is modulated only slightly by the phase comparator; the basic voltage is approximately -13 volts. This holds the emitters of Q710 and Q711 at about -13.5 volts, so that the base of Q711 must be very close to -13 volts in order for Q711 to "capture" its share of the current and become an amplifier. Thus, the tape speed must be such that the frequency-to-voltage converter and low-pass filter produce -13 volts. Too low a voltage will speed up the tape motion and, conversely, too high a voltage will reverse the torque and slow down the tape motion, as will be seen presently. In practice, the speed pot is adjusted so that, as the tape approaches the proper speed, the low-pass filter output will arrive at the proper voltage and allow the phase comparator to assume control.

Referring once more to the phase comparator, in the 1/60 second period between pulses, the capacitor C711 will charge from 0 volts to a little over -8 volts, and this represents the total voltage range out of the phase comparator for controlling the tape speed. After being applied thru the voltage divider formed by R2004 and the paralleled R729 and R730, the maximum voltage change available at the base of Q710 is little more than .2 volts, which corresponds to a tape speed change of about 14.75 to 15.25 IPS, when set for 15

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IPS. Thus, the phase comparator provides a vernier control of tape speed.

The differential amplifier output is taken from the collector of Q711, which is connected to the bases of the servo amplifier transistors Q802 and Q807. The current thru the Q711 collector will increase if the low-pass filter output voltage goes less negative (tape speed decreases), or if the phase comparator output voltage goes more negative (tape phase pulse is late relative to the xtal osc. pulse).

4.6.2.6 SERVO AMPLIFIERS

Transistors Q802 and Q302 constitute the "servo" (or driver) amplifier for the take-up reel motor. Similarly, Q808 and Q301 constitute the supply reel motor servo amplifier, in this case preceded by an inverting amplifier (Q807) designed to provide some negative feedback.

To understand the operation of the servo amplifiers, look first at the take-up reel motor amplifier, Q802/Q302. The motor has approx. -19 volts applied to one terminal, while the other terminal goes thru Q302 and R303 to ground. Q302 acts as an "emitter follower", so that it applies to the motor winding whatever voltage is on its base. As long as Q802 is biased "off", R808 holds Q302's base at emitter potential, Q302 is "off", and no current flows thru the motor. However, as the base of Q802 goes negative by about 1.5 volts (Q802 is a Darlington-pair, and has a double diode forward voltage drop) and biases Q802 "on", the collector of Q802 swings positive (less negative), swinging the base of Q302 positive with it. The Q302 emitter "follows" its base in a positive direction, applying a voltage drop across the motor which starts the tape moving. The amount of voltage so applied (and therefore torque) is proportional to the Q802 base current, supplied by the differential amplifier output.

Observe R809 connected between the Q802 base and the tape lifter solenoid B303. During servo operation, the tape lifter is not energized and, since its coil has only a few ohms resistance, R809 is virtually grounded. This being true, the first 3/4 milliampere of current from the differential amplifier is used to produce the fraction of a volt across R809 to forward-bias Q802, and all further increase in base current is amplified to produce torque, as explained above.

The operation of the supply motor servo amplifier is essentially the same; however, it is not driven directly from the differential amplifier, but by the inverting amplifier instead. This will be explained later.

With the tape at rest or moving very slowly (such as right after PLAY is started), the filter output voltage is only slightly negative, applying that low voltage to the base of Q711 thru R728. This forward-biases Q711 strongly, and effectively clamps its emitter to the base of Q802. The combined forward diode drops across D302 and Q802 will permit the base of Q802 to go only about 3 volts negative, so the rest of the voltage drop (about 15 volts) appears across R731 in the differential amplifier. This same -15 volts is on

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the emitter of Q710, biasing it "off", and the phase comparator is momentarily out of the circuit. The Q802 base current turns Q802 on, and essentially full voltage is applied to the take-up motor.

If the tape "overshoots" its required speed, the filter output goes to more than the desired -13 volts. With Q710's base held at -13 volts, the emitters of Q710 and Q711 are held at about -13.5 volts, Q711 is now biased "off", Q802 loses its source of base current, and torque is applied to the supply motor to slow down the tape, as described next.

It was explained earlier that the exciting current for the takeup servo amplifier (at the base of Q802) came from the differential amplifier. The corresponding exciting current for the supply reel servo amplifier, applied to the base of Q808, comes thru R818 and R819 from Q810 (below the phantom line). During play and record modes of operation, Q810 is clamped "on", and its collector is held at -24 volts. The resulting current would turn on the supply servo amplifier and apply full reverse torque, if it were not inhibited by Q807.

The transistor Q807 constitutes a sort of differential amplifier by itself, the two inputs being its base and its emitter, respectively. A negative voltage increase on its base would increase its collector current, while a negative voltage increase on its emitter would decrease the collector current. As the Q807 collector current is increased, its voltage swings positive (less negative), so that less voltage is applied to R818, resulting in less base current at Q808 and therefore less reverse torque.

The differential amplifier output which is connected to the base of Q802 is also connected to the base of Q807. Thus, a negative voltage increase resulting in a takeup motor speed-up would simultaneously result in a decrease in reverse torque at the supply reel motor.

Observe that the emitter of Q301 is connected thru a voltage divider R816/R814 to the emitter of Q807. As Q301 draws more current thru B301 (supply motor), the emitter swings in a positive direction, driving the emitter of Q807 positive and reducing the drive to the servo amplifier. This constitutes negative feedback, and, in effect (during normal play mode operation), the voltage applied to B301 is proportional to the voltage excursion of the base of Q807.

The reel drive motors are brush-and-commutator type motors with permanent magnet fields. A significant characteristic of such a motor is its action as a generator. When the shaft of a permanent magnet motor turns, the motor generates a D.C. voltage proportional to its speed, of the same polarity as the voltage applied to the motor to drive it in that direction. (This generated voltage is called back emf.) Because of this, the motor draws less current, for a given applied voltage, as it picks up speed. Conversely, if the motor shaft is forced to turn in the opposite direction, the back emf is of the opposite polarity and the current increases; so does the torque.

As the takeup reel fills up with tape and the radius of the tape pack increases, it takes more motor current to pull the tape through. Part of this current increase results from the reduced motor speed, and the rest of the increase requires more takeup servo

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amplifier drive. At the same time, the supply reel is unloading, and reducing its tape pack radius, speeding up that motor and increasing its back emf. In order to maintain uniform tape tension and motion throughout a reel of tape, the relationships between servo amplifier gains, thresholds and other characteristics are quite complicated, and far beyond the scope of this writing. It is sufficient to say that any indiscriminate changing of the values or tolerances of resistors or other components of the servo system can only result in degrading its performance.

The network consisting of R701, C701, C725, D704 and D705 constitutes a negative feedback lead-network to slow down the high frequency response of the servo system and stabilize its operation.

When the play function is not in operation, Q810 is off, and ground potential is applied thru R826, R821 and D703 to the base of Q708 in the freq.-to-voltage converter, saturating Q708 and holding its collector at -18 volts. This biases off Q711 in the differential amplifier turning off Q802 and Q807. The base of Q808 is no longer biased on (thru R818 and R819), and thus both servo amplifiers are turned off.

4.6.2.7 CONTROL LOGIC SYSTEM

The portion of the control system described below, the "logic" system, involves on-off function only (in contrast with the "analog" servo system described above), and serves to establish the necessary conditions for each operational mode. Referring again to Figure 6-1, the entire tape motion control logic system is shown schematically below the phantom line (except for the stop mode tape tension circuit at the top).

The various modes are initiated by the six switches shown at the left end of the diagram: STOP, PLAY, REC, LOAD, FWD, and REW. Each switch has associated with it a thyristor and a tally light. The thyristor acts electronically as a "latch" to hold the circuit engaged once the switch has been actuated and then released. For purposes of this description, the important characteristics of the thyristors used in the system are as follows:

- (1) When the thyristor is "off", it will remain off as long as the "gate" electrode is held at cathode potential.
- (2) With voltage applied in the correct polarity across the thyristor (anode to cathode), swinging the gate at least .8 volts positive with respect to the cathode for a few microseconds will "trigger" the thyristor into conduction, and it will remain in this state even though the gate swings back to cathode potential.
- (3) Once conduction is initiated, it can be interrupted only by reducing the current thru the thyristor to zero, or at least below the holding current (usually a few milliamperes). This can be done by forcing the voltage across the thyristor to zero or less, or by forcing the gate negative.
- (4) In conduction, the forward voltage drop across the thyristor, at the currents encountered in this system, is about 1 volt.

With these things in mind, we can proceed to the switch circuits, all of which work essentially alike. Starting with the "STOP" switch, we see that the thyristor Q505 acts as a switch, in series with the lamp I503 as a load, between +1.2 volts and -24 volts. (The reason for the +1.2 volt common, rather than ground, will be explained later.) The gate of Q505 is held at cathode potential thru R501, and no current flows. If we now actuate the "STOP" switch, the +1.2 volts is applied thru R502 to the gate, turning Q505 on. The cathode swings to within about a volt of the anode, and the lamp has about 24.2 volts across it, drawing 40 milliamperes. This state is maintained when the switch is released. Note that the common circuit to all the rest of the switches goes thru the stop switch normally-closed contacts, so that voltage is removed from the other switches whenever "STOP" is actuated. This provides a double assurance of turning off whichever thyristor was previously turned on, as well as preventing any simultaneous operations.

Basically, all of the switches turn on their thyristors in the same manner. There are, however, some interlock circuits associated with them, which are explained later.

As noted earlier, once a thyristor is turned on, it remains on as long as it is carrying current, as if it were a diode. To turn it off, we must interrupt that current, which means reducing to zero, or reversing, the voltage across the thyristor momentarily. With one exception (explained later), this is done thru the commutating capacitors C501 thru C504. These are all connected to one line (LOAD), and a sharp positive voltage pulse applied to any one of them will be coupled thru all of them. Thus, whenever any thyristor is turned on (except RECORD), the sudden positive excursion of its cathode ~~is coupled to the other cathodes~~. If one of the other thyristors is on, the positive D.C. charge on its capacitor plus the positive pulse will drive its cathode positive with respect to its anode, thus reverse-biasing it and reducing its current to zero, and turning it off; it takes less than a millisecond for this to happen.

The interlocks mentioned earlier are provided to prevent simultaneous operation of switching circuits, where such operation would result in malfunction. Note that when "FWD" is pressed, its normally closed contacts are open and prevent "REW" from actuating. The same thing is true in reverse. Thus, it is impossible to actuate "FWD" and "REW" simultaneously. Similarly, when "LOAD" is pressed, neither "FWD" nor "REW" will go on. The "STOP" interlock was explained above. On the other hand, "LOAD" and "PLAY" can be actuated simultaneously, as there is no interlock between them.

A different type of interlock is used for the "REC" switch. When "PLAY" is not engaged, the anode of Q504 is at -24 volts, so that there is no voltage across Q504 with which to turn it on. When "PLAY" is engaged, the Q504 anode is at about +.2 volts and it is ready to be turned on. If the "PLAY" button is released, pressing the "REC" button cannot turn Q504 on since D501 is reverse biased and will not supply the necessary gate current to Q504. However, if "PLAY" is held down, gate current is supplied thru R504, and now both Q504 and Q506 are on. Pressing any one of the other switches will, as explained earlier, turn off "PLAY" thru one or two of the commutating capacitors, and when "play" is off, "rec" goes off with it.

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When both "play" and "rec" are on, C505 charges thru R507 to the voltage across I502, about 23 volts. If "PLAY" is then pressed, the negative end of C505 is swung in a positive direction thru R504, putting a positive pulse on the cathode of Q504, reducing the Q504 current to zero and turning it off. Or, alternatively, pressing "REC" puts a strong negative pulse on the Q504 gate, which will turn Q504 off as stated earlier.

Each switch circuit, when it goes on, swings its associated lamp voltage to about +.2 volts, and that same voltage swing is applied to the external circuit controlled by that switch. Some of the control circuits (load, forward, and rewind) involve inhibiting of transistors by forcing their bases to ground potential thru diodes. Since the sum of the thyristor and diode forward voltage drop is greater than the forward bias of a transistor, it is necessary to hold the thyristor anodes sufficiently positive to make sure the transistors will be "off" when inhibited, hence the +1.2 volt common. This voltage is obtained by connecting the motor power supply positive terminal to ground thru the double diode D303. The current thru the power supply also passes thru D303, holding its anodes at about +1.2 volts.

4.6.2.8 PLAY CONTROL CIRCUITS

On the system schematic (Figure 6-1), refer to the area just below the phantom line in the right hand half of the diagram. The play control from the switch, labeled "PLAY", goes thru R823 and R824 to the base of Q810. Before "play" is activated, this line is at -24 volts, and Q810 is biased off. When "play" is activated, this line applies a forward bias to Q810, turning it on. The collector swings to within about .2 volts of -24 volts, with the following results.

- (1) Thru D809, Q803 is prevented from being turned on by Q801 (to be explained later).
- (2) The supply servo system has -24 volts applied to it thru R819.
- (3) Diode D703 in the freq-to-voltage converter is reverse biased, allowing the converter to work as described later.
- (4) Forward bias is removed from the base of Q809, turning off "PRE" (unless the "PRE" switch is on or "REC" is activated).
- (5) Thru D310, -24 volts is applied to the winding of relay K301, enabling it to operate when the record switch is turned on (explained in detail later).

The tape is now moving under control of the servo system described earlier. The tape lifter drive transistor is off, and the tape lifter solenoid is de-energized. Although there is now a negative voltage on the "MOTION" line (as explained in the first part of paragraph 4.6.2.2), Q801 is inhibited by D803 and the very low resistance of the tape lifter solenoid to ground. Similarly, there is a negative voltage on the "DIR Q" line (explained below), but Q805 cannot get any current from Q806 which has no forward bias and is turned off. Thus, none of the servo amplifier inhibitor circuits below the phantom line are in effect.

4.6.2.9 DIRECTION SENSE CIRCUIT

To understand the derivation of the direction signals (e.g. "DIR Q"), it is necessary to refer to the SENSOR AND PULSE GENERATOR block of the diagram. The integrated circuit IC1101 is a digital dual "D" type flip-flop circuit, of which only one is in use here. It is characteristic of this device that when a positive-going pulse (trigger) is applied to the "clock" input (pin 11 of the IC), the "Q" output (pin 13) will assume the voltage state which was present at the "data" input (pin 9) when the pulse occurred, and will hold that state until the next pulse. The voltage state of the "Q" output (pin 12) is always opposite that of "Q".

The voltage on pin 9 is determined by the current thru Q1111, which in turn depends on the amount of light striking photo transistor Q1101. This last item, together with its light source D1101, is the third "chopped light" switch mentioned in paragraph 4.6.2.2: IPS/FREQUENCY CONVERTER. When light to Q1101 is interrupted, pin 9 swings negative (from ground potential). When light to Q1102 and Q1103 is interrupted, a pulse is applied to pin 11. Thus, for forward tape motion, we want Q1101 to be dark at the moment the pulse appears, so that the "Q" output will be negative. (The fact that pin 9 swings positive and then negative again between pulses does not alter the negative voltage on pin 13, as stated above.) To

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accomplish this, the D1101/Q1101 light switch is very accurately located so that a line on the chopper disc will encounter it 1/4 cycle (of chopper frequency) ahead of the other light switches, for forward tape motion. This angular displacement amounts to less than 1/2 degree, with a tolerance in the order of 5/100 degree. This placement is done precisely and permanently in manufacture, and should never be tampered with.

When the disc is turned in the opposite direction (reverse tape motion), the pulse occurs when pin 9 is positive, and consequently pin 12 is negative.

4.6.2.10 STOP CONTROL CIRCUIT

Assuming the machine to be running in "PLAY" mode, let us now push the "STOP" button. The cathode of Q505 swings positive and is latched at about +.2 volts. The positive voltage on the "PLAY" line is abruptly removed, by commutation thru C503 and C504, and by interruption of the common return; the "PLAY" line swings to -24 volts. Q810 is turned off, and its collector swings positive to ground potential thru R826. Excitation voltage to the supply servo amplifier (thru R819) is removed. Current thru R821 and D703 in the Frequency-to-Voltage Converter saturates Q708, removing excitation voltage from the takeup servo amplifier.

The positive swing of the Q810 collector is coupled thru C802 and R806 to the base of Q803, pulling its collector to -24 volts. The inhibiting diode D803 is now reverse biased, allowing Q801 to be driven to saturation by the negative voltage from the "motion" line. (The source of this voltage is explained in the first three paragraphs of 4.6.2.2)

The negative voltage now sustained on the collector of Q803 does four more things:

- (1) The tape lifter solenoid is energized, lifting the tape from the heads.
- (2) The -24 volts is applied thru J301 pin 29 to the power supply, increasing the voltage on the motors to about -33 volts.
- (3) Negative voltage is applied thru R811 to the base of Q806 saturating it and clamping the emitters of Q804 and Q805 virtually to ground. With a negative voltage on the "DIR Q" line, Q805 is now clamped "on", which holds the base of Q802 near ground and thus disables the takeup servo amplifier.
- (4) The negative voltage is applied thru R809 and R810 to the two servo amplifiers. The supply servo amplifier (Q808) is turned on in full, while the takeup servo is inhibited as just described.

The high reverse torque on the supply reel rapidly slows down the tape motion to a stop, and would actually reverse the tape motion, except for one thing. As soon as the tape motion stops, the voltage on the "MOTION" line drops to zero (ground potential), removing excitation to Q801 and de-energizing the tape lifter circuit. This removes the voltage from R809 and R810, again disabling both servo amplifiers; the tape remains stopped. The removal of tape lifter

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voltage allows the power supply to revert to the lower voltage of about -19 volts.

When the stop thyristor Q505 latched, it applied +.2 volts thru the "STOP" line and R105 to the base of Q104 (upper right hand corner of the diagram). As an emitter follower, Q104 applies ground potential thru R104 and diodes D304 and D305 to the reel motors. The resulting low and equal motor currents hold a light tension on the tape in the stopped mode.

In stopping from "REWIND" with the tape moving in the opposite direction, the action is identical in all respects but one; now it is the "DIR Q" line that has a negative voltage on it instead, clamping Q804 instead of Q805, and also it is the supply servo amplifier which is inhibited, and the takeup reel motor produces high torque to stop the tape motion.

4.6.2.11 LOAD CONTROL CIRCUIT

Pressing the "LOAD" button latches Q502 on, and commutates all other thyristors off. With +.2 volts now on the "LOAD" line, D802 inhibits the tape lifter circuit, so that "MOTION" line voltage produced when moving the tape will not initiate the stop sequence just described. Turning off Q505 removes the tape tension produced by Q104, and the tape is free to be moved by hand.

If the "PLAY" button is pushed, the load circuit will be commutated off, but if the "LOAD" button is held depressed while pushing the "PLAY" button, both circuits will be latched on simultaneously. The servo system will be turned on up to the servo amplifiers themselves; however, the positive voltage on the "LOAD" line is applied thru D806 and D807 to the two servo amplifiers, holding them off. The only difference observed when moving the tape in these two modes ("LOAD" only or "LOAD/PLAY") is that, in "LOAD" only mode, the preassigned monitor circuits are in effect; with "PLAY" also turned on, the preassignments are cancelled (unless the "PRE" switch is on).

With both "LOAD" and "PLAY" thyristors latched, pressing either button will not change anything, since there is no commutating voltage step available to turn anything off. Thus, when in "LOAD/PLAY" mode, it is only necessary to press "PLAY" and "RECORD" to go into record mode without starting the tape moving. On the other hand, pressing any other button will commutate both "LOAD" and "PLAY" off.

4.6.2.12 FORWARD AND REWIND CONTROL CIRCUITS

The "FWD" and "REW" circuits function essentially identically, the only difference being which servo amplifier is inhibited, as explained below. Hence, a description of the "FWD" mode leads to an understanding of the "REW" mode. Note that the two cannot be engaged simultaneously, as the two switches are mutually exclusive thru their normally-closed contacts.

When "FWD" is pressed, its thyristor Q503 is latched and any other switch circuit is commutated off. With +.2 volts now on the "FWD" line, three things happen:

- (1) The supply servo amplifier is inhibited thru D808.
- (2) Q806 is inhibited thru D805, disabling the "direction" circuits which would otherwise try to stop the tape motion.
- (3) Q803 is turned on thru R807, energizing the tape lifter, raising the motor voltage to -33 volts, and turning on the takeup servo amplifier thru R809 (as described in 4.6.2.10 for "STOP"). The stopped-tape tension is not present since "STOP" is off, and the tape moves toward the takeup reel at full speed.

When "REWIND" is pressed instead, the only differences are that Q806 is inhibited by D801 instead of D805, Q803 is turned on thru R803 instead of R807, and D804 inhibits the takeup servo amplifier instead of D808 inhibiting the supply servo amplifier.

When "FORWARD" or "REWIND" is dropped out by pushing "STOP" or "PLAY", the tape lifter is held on by the "MOTION" line as long as the tape is still moving in the normal stop mode described above. Q806 is no longer inhibited, and the tape is brought to a complete stop. If "PLAY" was pressed, Q810 is inhibited thru D811 until the tape stops and the tape lifter is released, at which time D811 is "disconnected" and Q810 is allowed to function as described in 4.6.2.8 above.

4.6.2.13 RECORD CONTROL CIRCUIT

As was noted earlier, when the "PLAY" circuit is engaged, -24 volts is applied thru D310 to one end of the K301 relay coil. Up to now, all three relays have remained de-energized, as shown in the diagram. If "PLAY" is held depressed and "REC" is pushed, turning Q504 on, the other end of the K301 coil swings positive and the relay actuates. The K301 contact 8 opening removes -24 volts from S404, the sync switch, to prevent energizing of the sync bus during record mode. The closure of K301 contacts 9/10 energizes K302. It also, thru D307:

- (1) Energizes the record bus in the line amplifiers (to be described later);
- (2) Thru D401, turns on I404, the "SYNC" tally light;
- (3) Thru D306, energizes the "PRE" bus (to be described later), which was released when "PLAY" went on.

K302 now actuates, with the following results:

- (1) K303 is actuated, which will hold off the sync bus voltage until K302 releases.
- (2) Applies, thru D308, a holding voltage to the record bus
- (3) Completes, thru K301 contacts 6/7, the bias oscillator turn-on circuit.

Upon turning off the record mode, either by releasing "REC" while still in "PLAY" or by pressing another button, K301 immediately releases, opening the bias oscillator turn-on circuit, as well as removing voltage from the K302 coil. The bias output is not interrupted abruptly; rather, it "ramps down" over a period of a fraction of a second, to avoid the clicks and pops on the tape

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commonly encountered when bias is suddenly interrupted.

The release of K302 is delayed briefly by C303, so that the record bus and sync bus are held in the recording status until the bias level has "ramped" down, after which time K302 and K303 release, and the record, sync and pre buses are restored to the non-recording status.

When the record mode is turned off by pressing "STOP" or fast shuttle in either direction, the tape lifter immediately lifts the tape, but does so slowly enough that the lifting action constitutes a form of "ramping" down the bias, even though it happens before the bias oscillator is completely off.

4.6.2.14 POWER SUPPLY CONTROL CIRCUITS

Refer to Figure 6-5, Schematic Diagram, Power Supply. The power supply contains two separate DC. power sources, each consisting of transformer, bridge rectifier and filter, and, when the autolocator is supplied, a separate commercial regulated power supply. Each is individually fused, and all of them are turned on by a single switch located on the tape transport.

The secondary voltage of T101 is approximately 40 volts RMS producing, thru the bridge rectifier D101 and filtered by C101, about 60 volts DC. This unregulated voltage is transmitted to the bias oscillator module, where it is regulated and distributed to the various parts of the audio system. This is further described in section 4.6.4.

The secondary voltage of T102 is approximately 27 volts RMS which, after being rectified by the bridge rectifier D102 and filtered by C102, produces about -38 volts DC. This unregulated voltage supplies the 24 volt regulator, and also the reel motor power when in fast shuttle and while stopping. From the T102 secondary center tap we get half-voltage, or about -19 volts DC, filtered by C103, which supplies reel motor power in play mode and when stopped.

The plug-in regulator card in the power supply serves to regulate the -24 volts used for the logic system, and also contains switching circuits and an overload current limiter circuit for the reel motors, as described below.

The -24 volt regulator consists basically of a voltage reference zener diode D206, an amplifier Q202, and transistors Q201 and Q101 connected as a Darlington pair to control the output current. With the card connector pin 1 (J101) at -38 volts, the collector of Q201 is at -38 volts, which is also applied thru R201 and R202 to the base of Q202. With Q201 and Q101 both acting as emitter followers, the emitter of Q101 would also be at -38 volts except for the Q202 circuit. The emitter of Q202 is effectively held at -24 volts by D206. The emitter of Q101 is connected thru pin 10 and R203 to the base of Q202 and, as soon as this voltage rises to about -24.6 volts, Q202 draws base current. The Q202 collector now draws current thru R201 and swings positive to about -24.2 volts. This reduces the voltage on the base of Q201, and the final voltage on pin 10 is slightly over -25 volts.

It should be noted (and remembered) that the ground symbol in Figure 6-5 represents only a common circuit for that diagram, and is not actually at system ground potential. By referring once more to Figure 6-1, in the lower left hand corner, the positive terminal of the reel motor power supply is carried thru J301 pins 25/26 and D303 to system ground. Thus, the apparent ground shown in Figure 6-5 is actually about 1.2 volts positive with respect to system ground, since all of the reel motor current returns to the power supply thru D303. (The tally light current from all of the static group switches also goes thru D303.)

The case and chassis of the power supply unit are not grounded, but are completely isolated.

On pin 3, the voltage applied from the logic system depends on the status of the tape lifter circuit, as explained in 4.6.2.10: STOP CONTROL CIRCUIT. In play mode or with the tape at rest, pin 3 is at -1.2 volts (relative to power supply common), and with -19 volts on the emitter of Q204, it is biased off. This leaves Q203 and Q102 also "off", and current from the -38 source does not flow to the output. Instead, the collector of pass transistor Q103 is supplied with -19 volts thru D201. With the base of Q205 heavily forward-biased thru R206 from the -38 volt source, both Q205 and Q103 are saturated, and -19 volts is now fed, thru D201, Q103, R103 and M101, to the reel motors.

As more current is drawn from the power supply, thru the total resistance of R103, M101, and the two wires to J301 pins 21 and 22, the voltage drop across this total resistance increases, and the voltage at J101 pin 8 becomes more positive relative to the base of Q205. As soon as this voltage is high enough to exceed the forward drop across D202 thru D205, any further voltage increase (due to increased output current) will force the base of Q205 in a positive direction, reducing the voltage on the base of Q103 and therefore the output voltage. This constitutes a current limiting function, and limits the output current to about 10 amperes. Note that the resistance of the wires is part of this critical total resistance, and must not be changed.

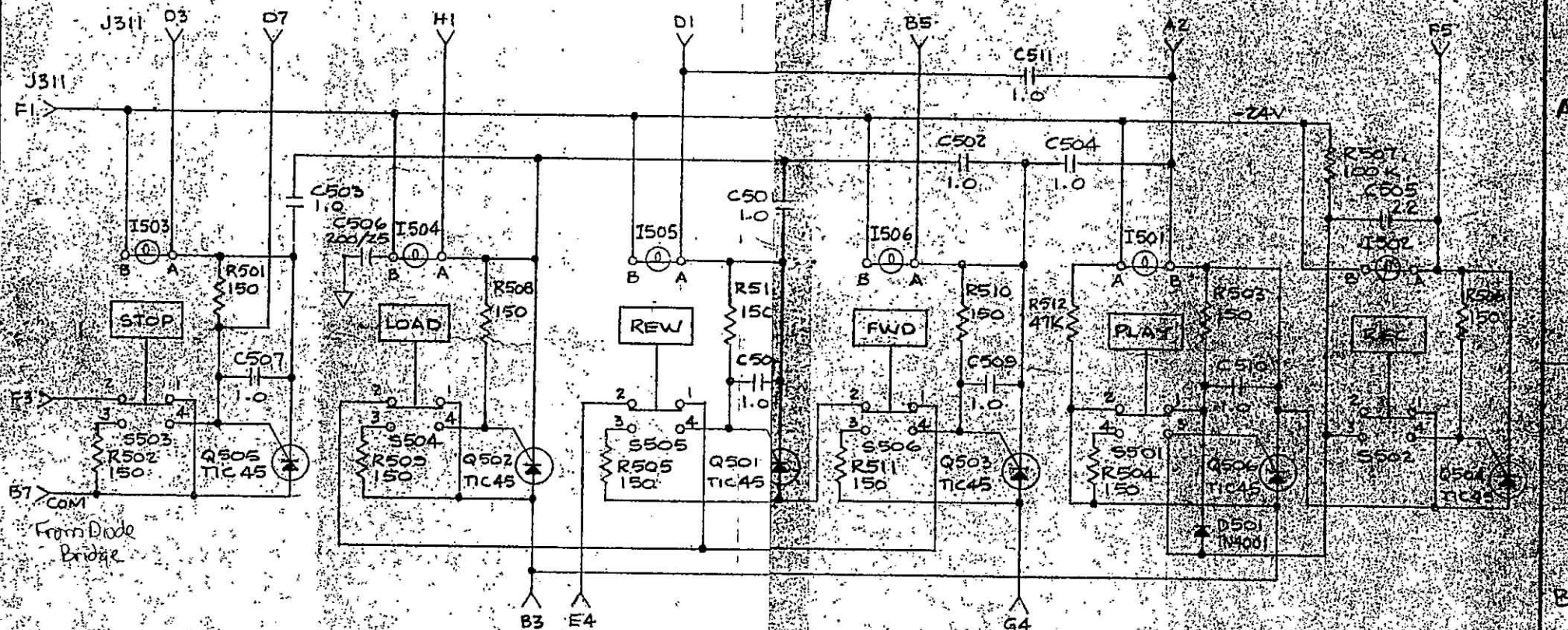
Returning to J101 pin 3, the voltage from the tape lifter circuit, when stopping or in fast shuttle mode, is -24 volts. This drives Q204 into saturation (thru R204 and R205), clamping its collector to -19 volts which, in turn, thru R207 drives Q203 and Q102 into saturation. This now connects -38 volts to the Q103 collector, disconnecting the collector from -11 volts by reverse biasing D201. The current limiting circuit still works as described above.

With the higher voltage applied to the reel motor, and with the associated servo amplifier full on, a considerable amount of current is drawn from the transformer/rectifier/filter combination where, due to its internal impedance, the source voltage drops to about 33 volts.

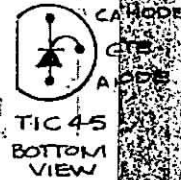
For the computer power supply (when used), the reader is referred to the power supply manufacturer's data.

ALL RESISTORS 1/4 WATT
ALL CAPACITORS 50VOLT AND IN MICROFARADS

REVISIONS			
LTR	DESCRIPTION	DATE	BY



LAST SYM. NO. USED	NO. OMLTTED
C511	
D501	
Q506	
R513	

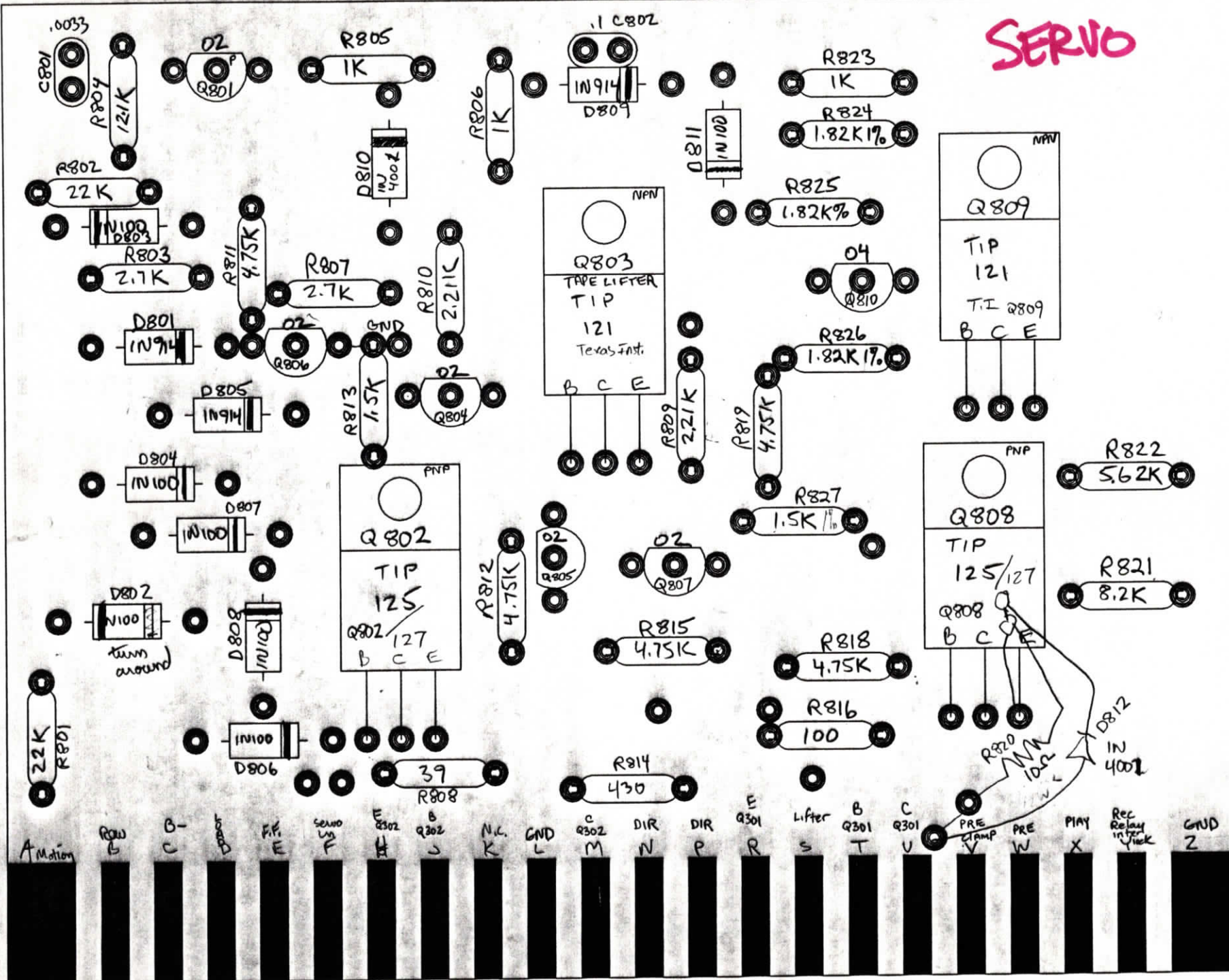


STEPHENS ELECTRONICS, INC.		
SCALE: 1/2"	APPROVED BY:	DRAWN BY: GEFK
DATE: 28 SEP 79		REVISED:
DYNAMIC CONTROLS MODULE		
MODEL: 1037/1043	FIGURE 6-19	DRAWING NUMBER: 6C-0581

PRINTED ON NO. 10001 ELAPAPER

SERVO

SERVO



CHECK OUT **FOR**
FINAL ACCEPTANCE REPORT INSTRUCTIONS
STEPHENS **821-B**

1. CUSTOMER: Studio purchasing recorder/reproducer.
2. ORDER_NO: Same as job #, 3 digit #.
3. SYSTEM_TYPE: Model No. eg., 821B-104A-24 QII.
4. POWER: 110/125 volts a.c. (unless otherwise specified).
5. FREQUENCY: 50/60 cycles.
6. SPEED: 15, 30 and 60ips (unless otherwise specified).
7. TAPE_WIDTH: 1/2", 1" or 2" (dependent upon the number of tracks).
8. NO. OF TRACKS: 2, 4, 8, 16, 24, etc.
9. HEAD_TYPE: Manufacturer and model number.
10. SERIAL_NO: Serial No. on the head.
11. BIAS_FREQUENCY: Normally 204 KHz, fill in actual frequency checked on bias chassis output. (See #38).
12. BIAS_VOLTAGE: Peak sign wave output from bias chassis output coil, normally 225 volts peak to peak (See #38).
13. WOW & FLUTTER: (WRMS filter, NAB standard)
Record/playback measurements as checked on the sentinel flutter meter set on the .1% scale, NAB WTD. (5-200Hz) (see #56).
14. TAPE_TENSION: Supply - Measured with tentelometer between the supply reel and the incoming guide assembly.
Take-up - Measured between the outgoing guide assembly and the take-up reel. Both measurements taken mid-reel. (for 1" tape, deduct 20 grams from actual readings.)
15. MOTOR_CURRENT: The measurement of the current draw as taken from the power supply mounted amp meter.
16. DYNAMIC_CONTROLS: (Transport and remote) Check all shuttle modes. Do not put machine into record mode until the bias and record systems have been checked out!
17. 15, 30, SCAN: Check to see that all three speeds operate and are on speed. Adjust speed trimpots as necessary.
18. PHASE_LOCK: Check to see that all three speeds are phase locked to the crystal time base. Note the phase lock on the VS0 meter. The needle should be steady with the machine on speed. Adjust the speed trimpots for each speed to register 4 milliamps
19. VS0: Check to see that in VS0 mode the red indicator lamp comes on next to the switch and that the speed is adjustable. Check the VS0 meter calibration in BS0 mode adjusted for slow sweeps, the needle should move full scale.

20. LAMPS_&_LEDS: Check to see that all lamps and LEDS function.
21. PRE: Check to see that PRE works by assigning channels to source. Input should be heard on tape recorder output whenever the PRE button is lit. PRE should be lit in all shuttle modes except play and should light in play mode when manually actuated. Check on deck and remote unit, if so equipped.
22. SYNC: Check to see that all sync relays are actuated when sync is depressed. The synclight should also light when sync is actuated.
23. SOURCE: Input should be heard on the tape recorder output of each channel when source is assigned with pre lit. Input should be visible on the VU meters with source assigned. Assign all channels to source. Apply a +15 dbm 1KHz signal to the tape recorder input, with pre not lit, measure the output on each channel, it should be -35 dbm minimum.
24. VU_METERS: All meters should be checked for accuracy, that is, a 1KHz signal at +4db should equal "0" VU. Check all meters
for sticking by spiking them with a +10dbm or better signal (enough to make them pin) adjust the bumper stops on any sticking meters.
25. Set up the record, low frequency E.Q. (15 & 30 ips) and play level pots so that they are one turn from being fully clockwise.
26. Set up the high frequency record and play E.Q. pots and the bias level pots so that they are centered.
27. Power up the machine and note that each channel's VU meter deflects twice during the power up surge. If a VU meter does not deflect twice, it is an indication of a problem on that channel, correct before continuing.
28. PLAYBACK: Check for playback in the play and sync modes on all channels @ 15 & 30 ips by using the head demagnetizer as a signal in close proximity to the head stack. Use a VARI-AC (variable transformer) to reduce the signal level from the demagnetizer and to keep it from burning out. Depress load and play simultaneously to put the unit into the play mode without the reel motors actuated.
29. If all channels are working, clean and degauss (demagnetize) the heads.
30. Using the 30 ips alignment tape, align the audio playback circuitry for "0" VU (+4dbm) using the PLAY head for playback @ 1KHz and 10KHz. Use the Hewlett Packard Voltmeter on the test stand for measurements by monitoring each channel's individual playback output.
31. Check the playback level and high frequency e.q. pots full sweep, checking for dropouts. Replace any faulty pots. Check off sheet if all pots operate properly.
32. Calibrate the SYNC and PLAY head play back level at 1KHz using the alignment tape.
33. With the PLAY head aligned @ 1KHz and 10 KHz, check the 30 ips

reproduce - PLAY head.

34. Depress the SYNC switch and check the 30 ips reproduce, SYNC head

35. Repeat $\pm 30, 31, 33$ and 34 using the 15 ips alignment tape.

36. check the playback phase of the play and sync heads at 12KHz.

37. RECORD: The first step on record is to check that the bias system is operational and is at the correct frequency and output voltage level. To check the bias chassis output connect the scope center probe to the bias chassis output coil white/black wire and the ground lead to the deck chassis ground. Depress load, play and record simultaneously and check for the bias signwave output on the scope, if no output appears, shut down from record immediately to keep from burning up the bias oscillator transistors. Check for a defective bias chassis, if sinewave is

attained,

check the peak to peak voltage (normally 225 volts). If the output voltage is correct, connect the frequency counter in parallel with the scope probe and measure the bias frequency (normally 204 KHz). If the bias chassis output and frequency are within specs, install the bias chassis back into the deck.

38. Connect the scope probe center lead to one of the bias output transistors yellow wires and the ground lead to chassis ground. Put the machine in the record mode and while watching the bias signwave on the scope, put one channel at a time into record. If the signwave should dissappear when assigning a channel, shut down from record immediately. Check the erase head on that channel for a shorted winding and if there is no problem with the erase head, check the pre-amp chassis record circuitry for a short circuit on that channel. Note any differences in signwave amplitude when assigning channels into record.

39. Check the record pre-set (latch) functions on each channel. Put the machine into record mode and check to see that the channel
x1 assign indicator for each channel actually trips the record and sync relays for that channel. Check to see that the recorded signal on each channel is evident on both the output and on the VU meter on the channel assigned to record.

40. Put 8 channels in record at a time and align the bias and record levels (bias is over bias $1/4$ db @ 1KHz). Align the record level after biasing to register zero VU (+4dbm) at 1KHz and 10KHz. Check the bias and H.F. record pots for full sweep and replace and defective pots. Check the 1KHz and 10KHz record levels after this low frequency adjustment and adjust the playback level pot accordingly @ 1KHz. (the L.F. playback level pot will affect the 1KHz overall playback level).

41. Check the 15 ips record/reproduce alignment (1KHz & 10 KHz should be zero VU). Our specs are ± 1 db from 30 Hz - 16 KHz.

42. Change the speed selector switch to 30 ips and align the bias and record levels for 30 ips at 1 KHz and 10 KHz to zero VU (+4dbm). Set the 30 ips low frequency E.Q level pots at 100 Hz to read +1db with every other channel in record (1, 3, 5, etc.). Check the 1 KHz and 10 KHz record levels after this adjustment and adjust the playback level accordingly @ 1 KHz.

43. Check the 30 ips record/reproduce alignment (1 KHz & 10 KHz should be zero VU). Our specs are ± 1 db from 35 Hz - 25 Hz.
44. Check the rolling record punch in/punch out features on both the deck and the remote unit. You should be able to punch out into play from record by hitting either the record or play buttons. You should not be able to go into record by hitting the record button without holding down the play button at the same time. If all functions check, check off the record box on the check out sheet.
45. Check the record Phase @ 12 KHz @ zero VU. (instructions here).
46. On 4300 series Line Amp cards, check the mute circuit. Play a zero VU (+4dbm) level off the tape (15 or 30 ips) and assign all channels to mute. When pressing the PRE button all outputs from the machine should be muted to -70 dbm. Check each channel for pops when assigning to mute with pre lit, and also when the channel is already assigned to mute check for pops when pressing PRE, actuating the mute circuit. On 4500 series Line Amp cards, check that the audio of each channel is muted in the rewind and fast forward modes.
47. Check the signal to noise ratio on each channel. (instructions here)
48. Check at what signal level a 3% THD is reached using Scotch 250 tape (unless otherwise specified) (instructions here)
49. Check the erasure depth as referenced to +10 dbm using Scotch 250 tape (unless otherwise specified). Record a + 10 dbm signal on tape @ 1 KHz & 30 ips. Using the Philco frequency selective voltmeter, tune it to 1 KHz with a 100 Hz bandwidth. Fine tune it while recording the 1 KHz tone. Rewind tape and play back approximately 10' of the 1 KHz + 10 dbm signal. Switch the AFC switch on the Philco unit to "ON" Remove the signal source and put the machine into record. Measure the residual 1 KHz signal left on the tape. Put this -db number in the boxes on the check out sheet (e.g., after erasure a -55dbm signal is left on the tape, as referenced to a +10 dbm signal, that is a total of 65 db of erasure).
50. Check the square wave response @ 1 KHz. This is the record/reproduce square wave response as played back off the tape at "0" VU. Connect the scope to the machine output and check each channel. The square wave response should be virtually identical in shape and amplitude on an aligned machine. A change in amplitude indicates record/reproduce levels are off, a change in shape usually indicates a faulty amplifier module in the record/reproduce chain. The output must be monitored during the playback of a recorded tape so that the bias signal is not visible. Put a check on each channel which passes this test.
51. RECORD_TRANSIENTS: Record transients are "spikes" or "pops" audible either in the monitors or on the tape when going in and out of record mode. Use no input signal for this test.
- "TAPE" - indicates a check for an audible monitor pop when punching in and out of record without any channels assigned to input and with the sync button out and not lit. Check tape playback for

any "ticks" or "pops" recorded on tape going in or out of record.

"PLAY/SOURCE" - indicates a check for an audible monitor pop when punching in and out of record with the sync button out of source pre-set.

52. "SYNC": Indicates a check for an audible monitor pop when punching in and out of record with no channels pre-assigned to source and the sync button depressed (lit).
53. "SYNC/SOURCE": Indicates a check for an audible monitor pop when punching in and out of record with the channels assigned to source and the sync button depressed (lit).
54. When testing is completed, the 30 ips playback alignment should be set for +3 VU @ 1KHz and 10 KHz. Bias and align 30 ips record to the type of tape specified by the purchaser of the machine (if none specified, use Scotch 250).
55. VERTICAL_DRIVE: (Those machines so equipped) Check to see that the vertical drive functions. See "Vertical Drive" instructions.
56. WOW_&_FLUTTER: Using the Sentinel flutter meter, connect the 3 KHz osc. output of the flutter meter into the tape recorder input. Connect in 3 KHz in of the flutter meter to the output of the tape recorder. Put the tape recorder in the record mode on all channels. Monitoring the output of one of the center channels on the recorder, switch the flutter meter to the "set level" setting. Adjust the set level pot so that the flutter meter reads full scale deflection (1.0 or .3). Set the flutter meter to the .1% scale reading and the "NAB WTD 5-200Hz" setting, allow a few seconds to stabilize and read off the % of flutter.

REVISIONS			
LTR	DESCRIPTION	DATE	BY

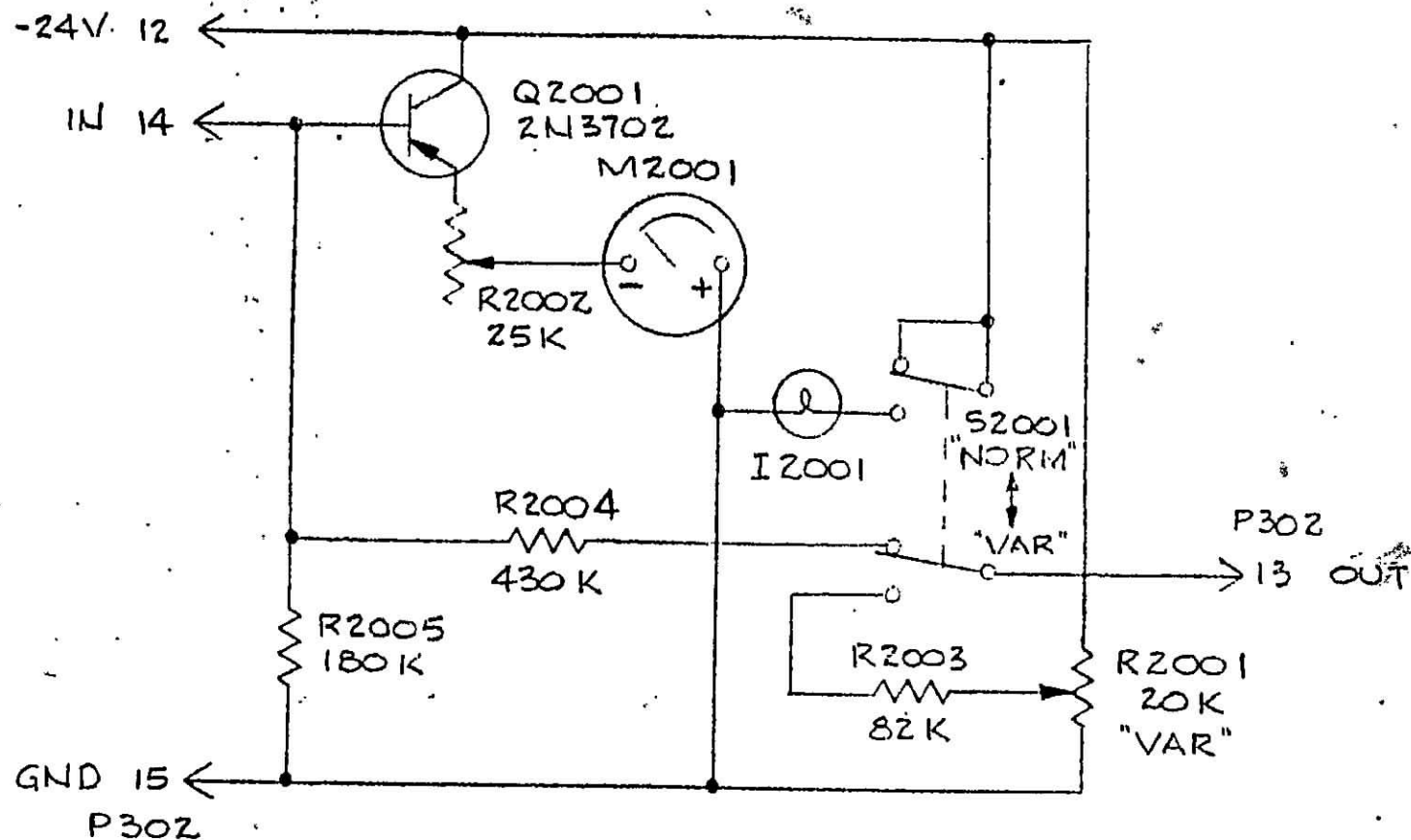
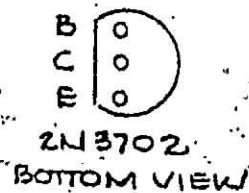


FIGURE 6-17



STEPHENS ELECTRONICS, INC.

SCALE: 1

APPROVED BY: *[Signature]*

DRAWN BY GEIER

DATE: 24 SEP 79

REVISED

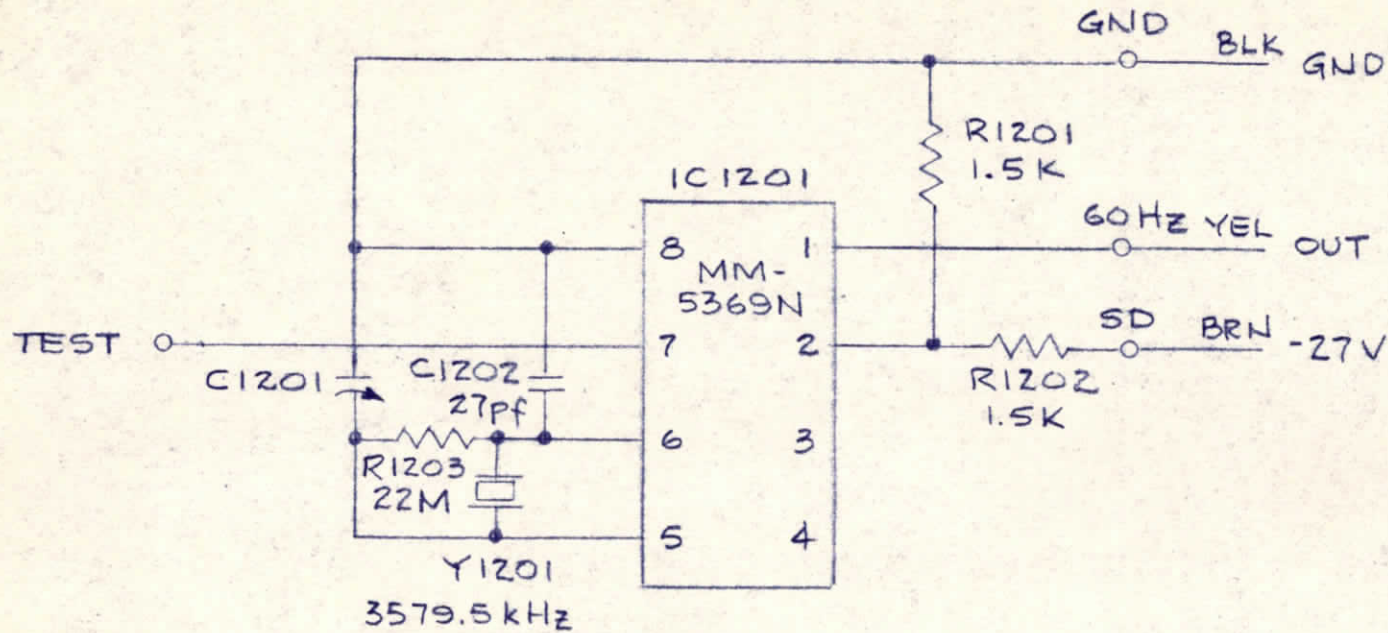
VSO MODULE

MODEL 821-B

FIGURE 6-17

DRAWING NUMBER
SC-2001

REVISIONS			
LTR	DESCRIPTION	DATE	BY



THIS SCHEMATIC APPLIES TO MACHINES
UP TO AND INCLUDING SN 1064

STEPHENS ELECTRONICS, INC.

SCALE: ~

APPROVED BY:

DRAWN BY GEIER

DATE: 19 SEP 79

REVISED

CRYSTAL FREQUENCY CONTROL CARD

MODEL 821-B

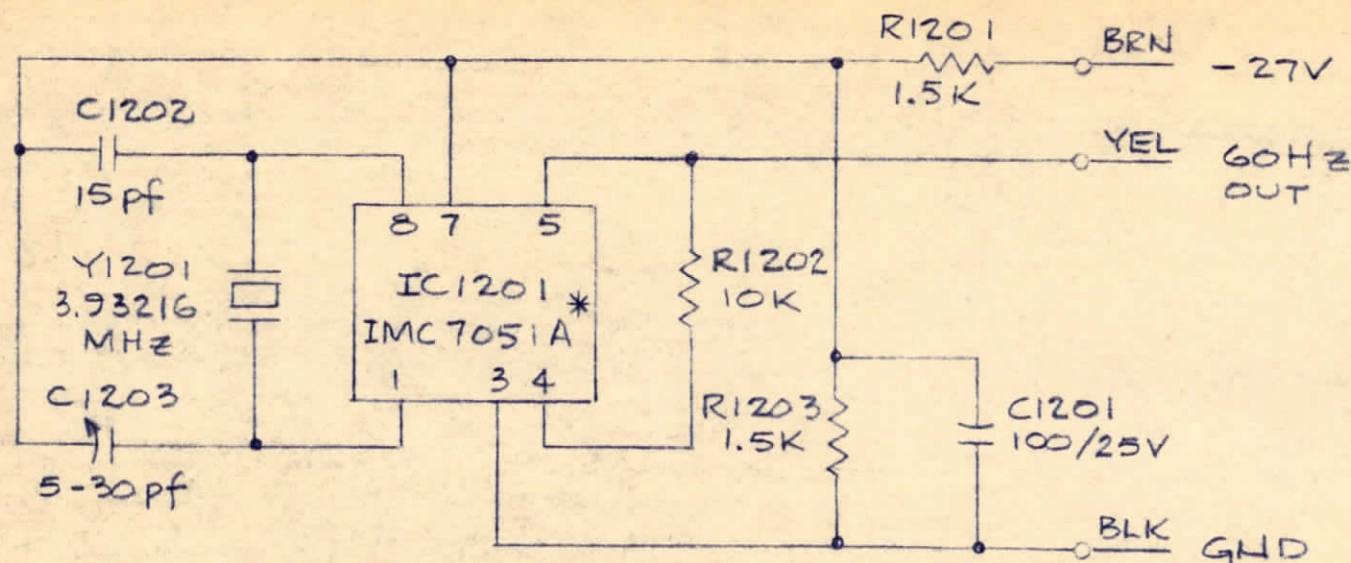
FIGURE 6-13

DRAWING NUMBER REV.

SC-1201

FIGURE 6-13

REVISIONS			
LTR	DESCRIPTION	DATE	BY



* ALTERNATE : ITS 9042-1

USED ON SN 1065 AND UP

STEPHENS ELECTRONICS, INC.

SCALE:

APPROVED BY:

DRAWN BY GEIER

DATE: 20 OCT 79

REVISED

CRYSTAL FREQUENCY CONTROL CARD

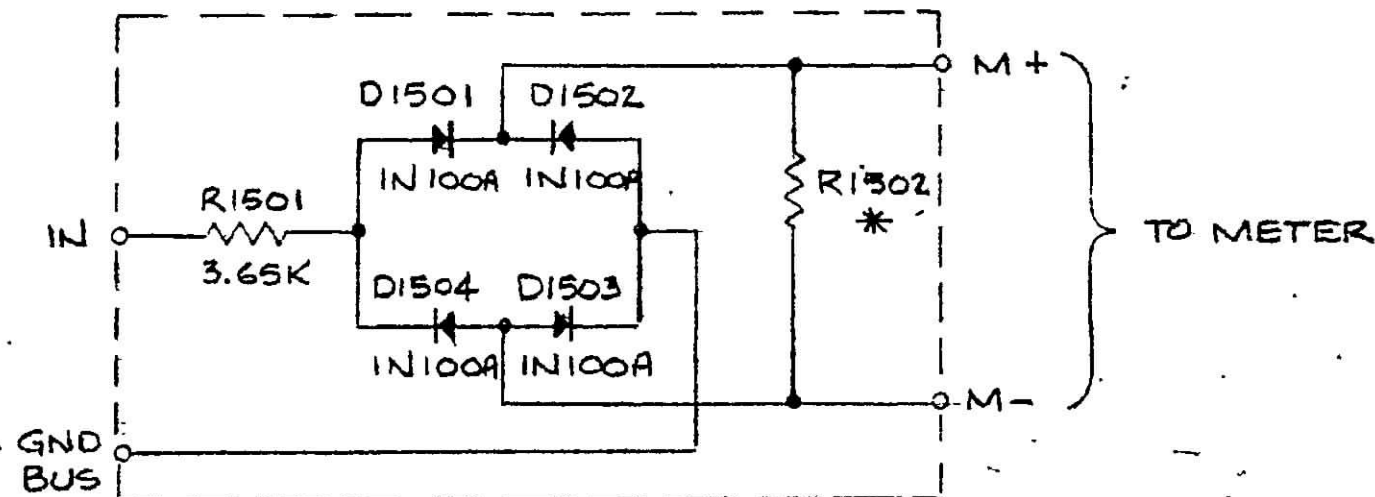
MODEL 821-B

FIGURE 6-13

DRAWING NUMBER
SC-1202

FIGURE 6-13

REVISIONS			
LTR.	DESCRIPTION	DATE	BY

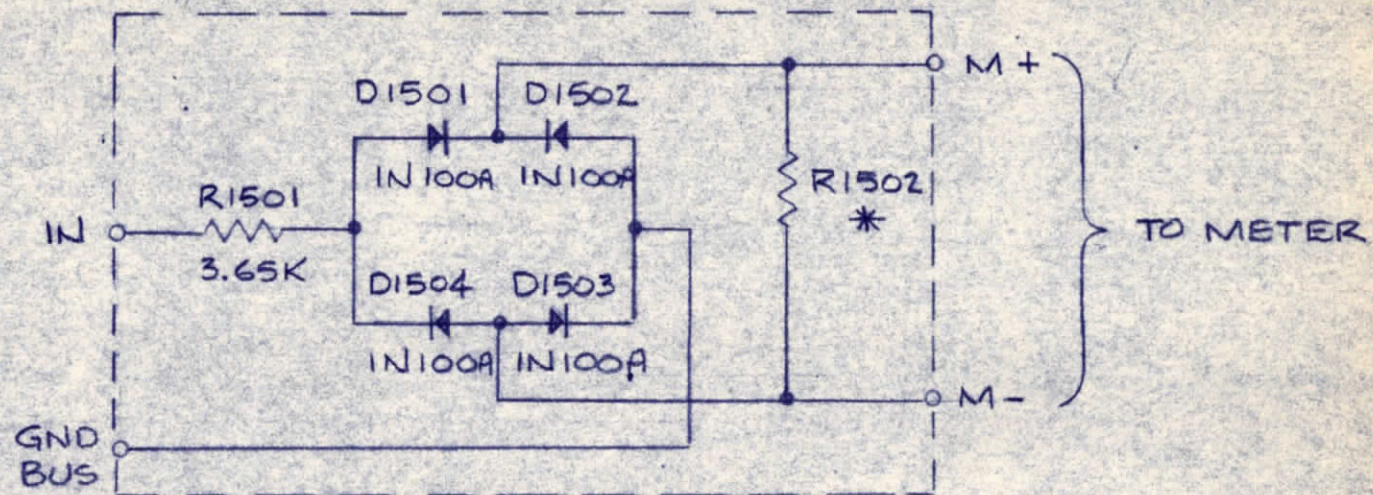


* CALIBRATION RESISTOR,
SELECTED AT FACTORY TO
MATCH METER SENSITIVITY

FIGURE 6-16

STEPHENS ELECTRONICS, INC.		
SCALE:	APPROVED BY:	DRAWN BY: GETER
DATE: 24 SEP 79		REVISED:
METER CALIBRATION CARD		
MODEL 821-B	FIGURE 6-16	DRAWING NUMBER SC-1501

REVISIONS			
LTR	DESCRIPTION	DATE	BY

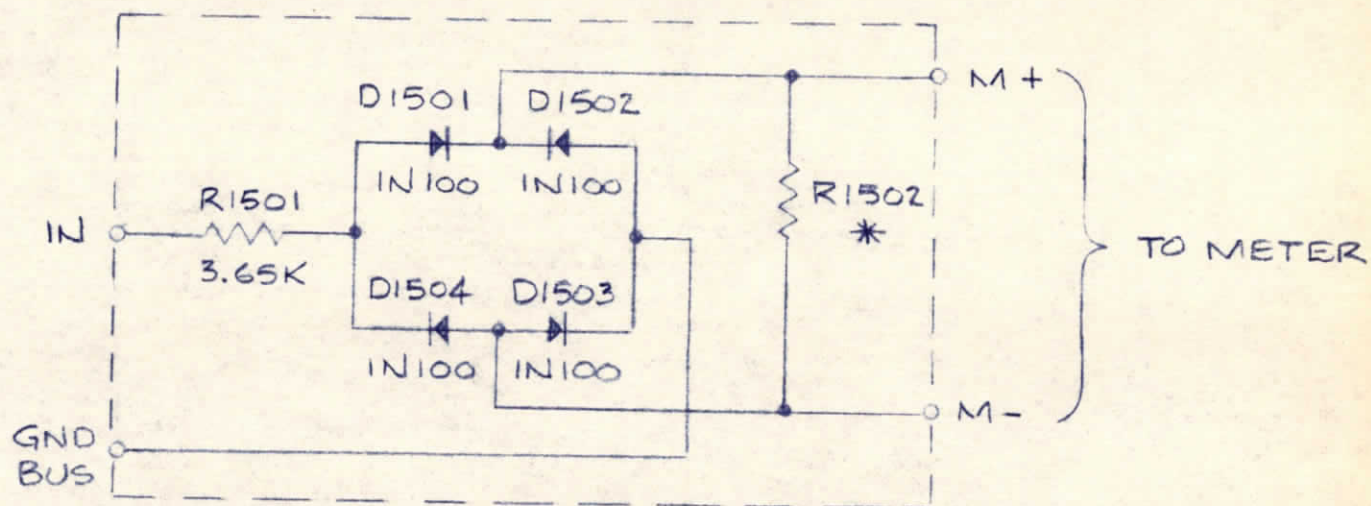


* CALIBRATION RESISTOR,
SELECTED AT FACTORY TO
MATCH METER SENSITIVITY

FIGURE 6-16

STEPHEN'S ELECTRONICS, INC.		
SCALE:	APPROVED BY:	DRAWN BY: GEYER
DATE: 24 SEP 79		REVISED
METER CALIBRATION CARD		
MODEL 821-B	FIGURE 6-16	DRAWING NUMBER SC-1501

REVISIONS			
LTR	DESCRIPTION	DATE	BY



* CALIBRATION RESISTOR,
SELECTED AT FACTORY TO
MATCH METER SENSITIVITY

STEPHENS ELECTRONICS, INC.

SCALE:

APPROVED BY:

DATE: 24 SEP 79

DRAWN BY GEPER

REVISED

METER CALIBRATION CARD

MODEL 821-B

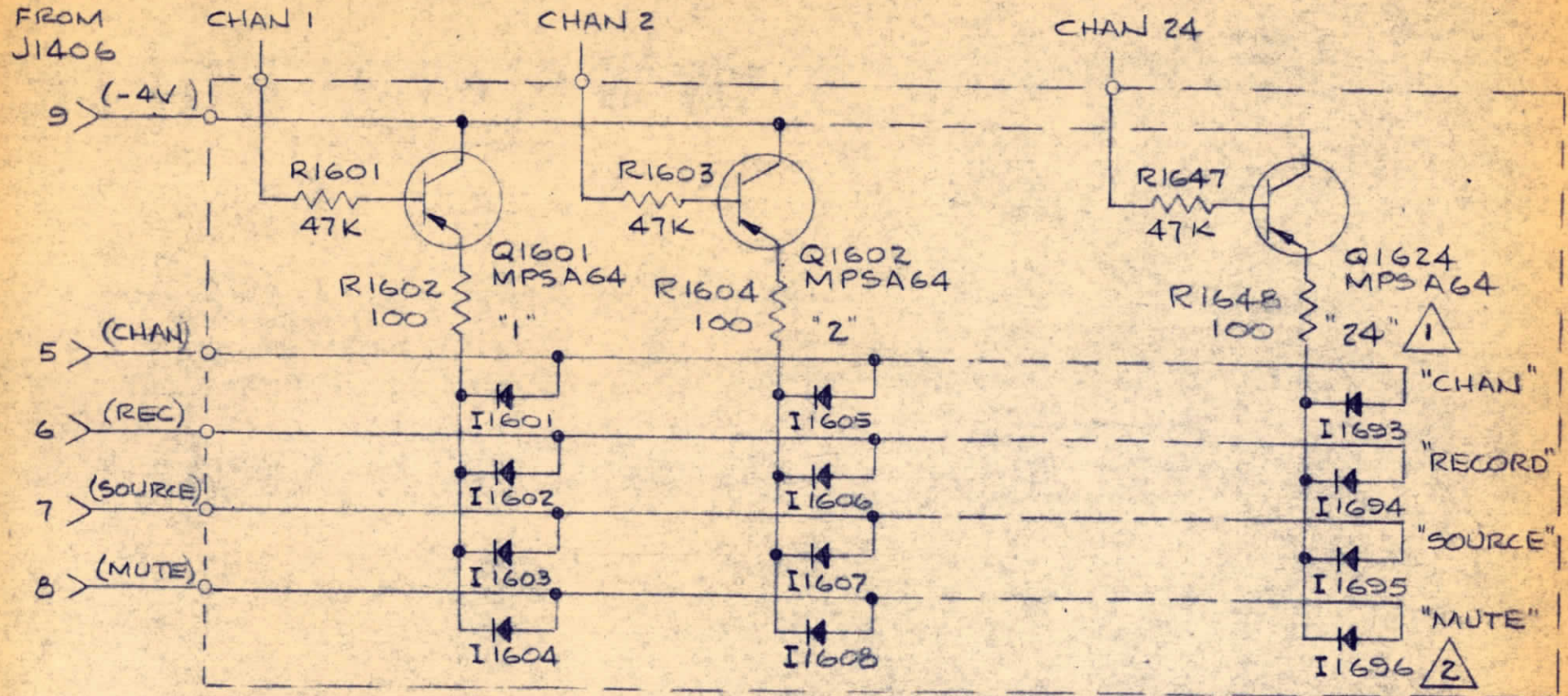
FIGURE 6-16

DRAWING NUMBER

SC-1501

FIGURE 6-16

REVISIONS			
LTR	DESCRIPTION	DATE	BY



B 0
C 0
E 0

MPSA64
BOTTOM VIEW

2 LED CARD UNIT SERIES CONTINUES INTO 1700'S FOR 32 & 40 TRACK.

1 24 TRK VERSION SHOWN. LAST NO. CORRESPONDS TO NO. OF TRACKS

STEPHENS ELECTRONICS, INC.

SCALE:

APPROVED BY:

DRAWN BY GEIER

DATE: 22 OCT 79

REVISED

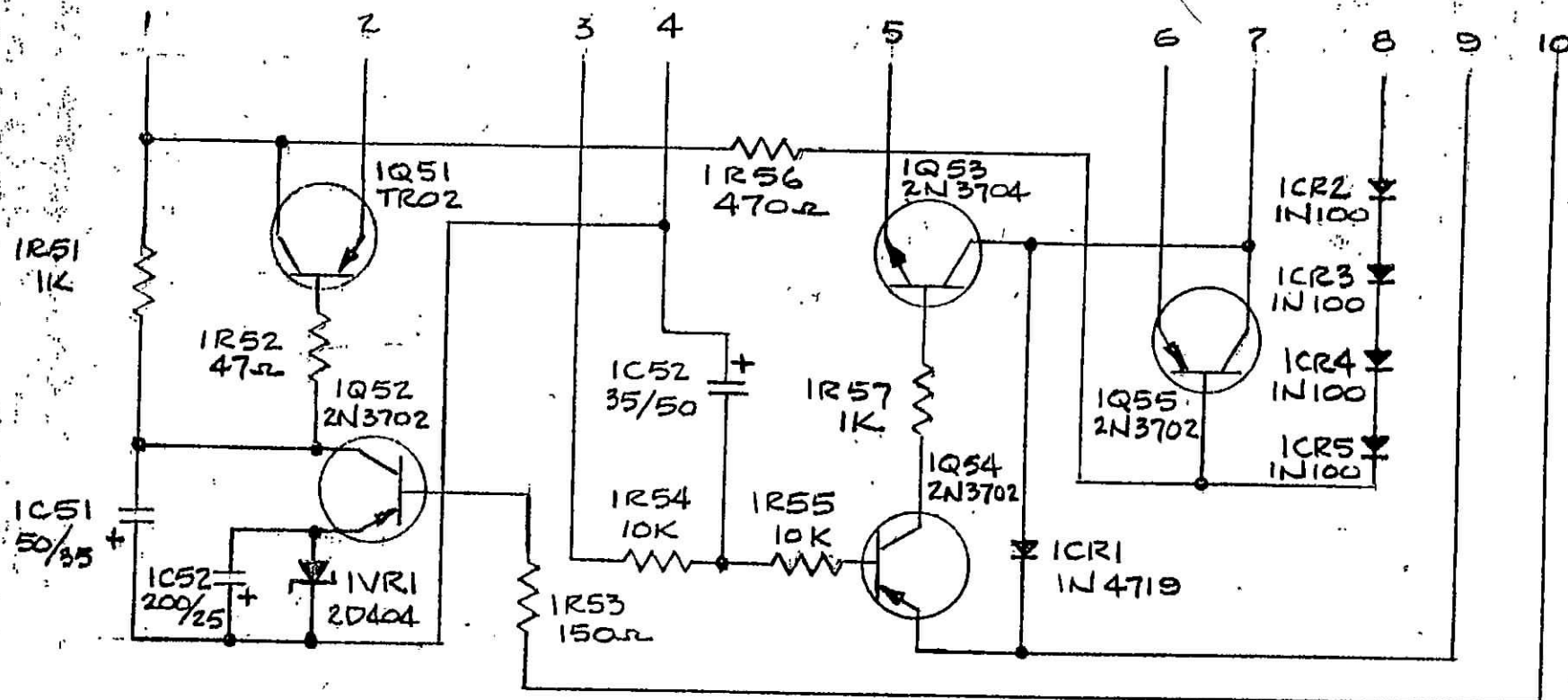
LED CARD

MODEL 821-B

FIGURE 6-14

DRAWING NUMBER

SC1601



STEPHENS ELECTRONICS, INC.

SCALE:

APPROVED BY:

DRAWN BY *GEIER*

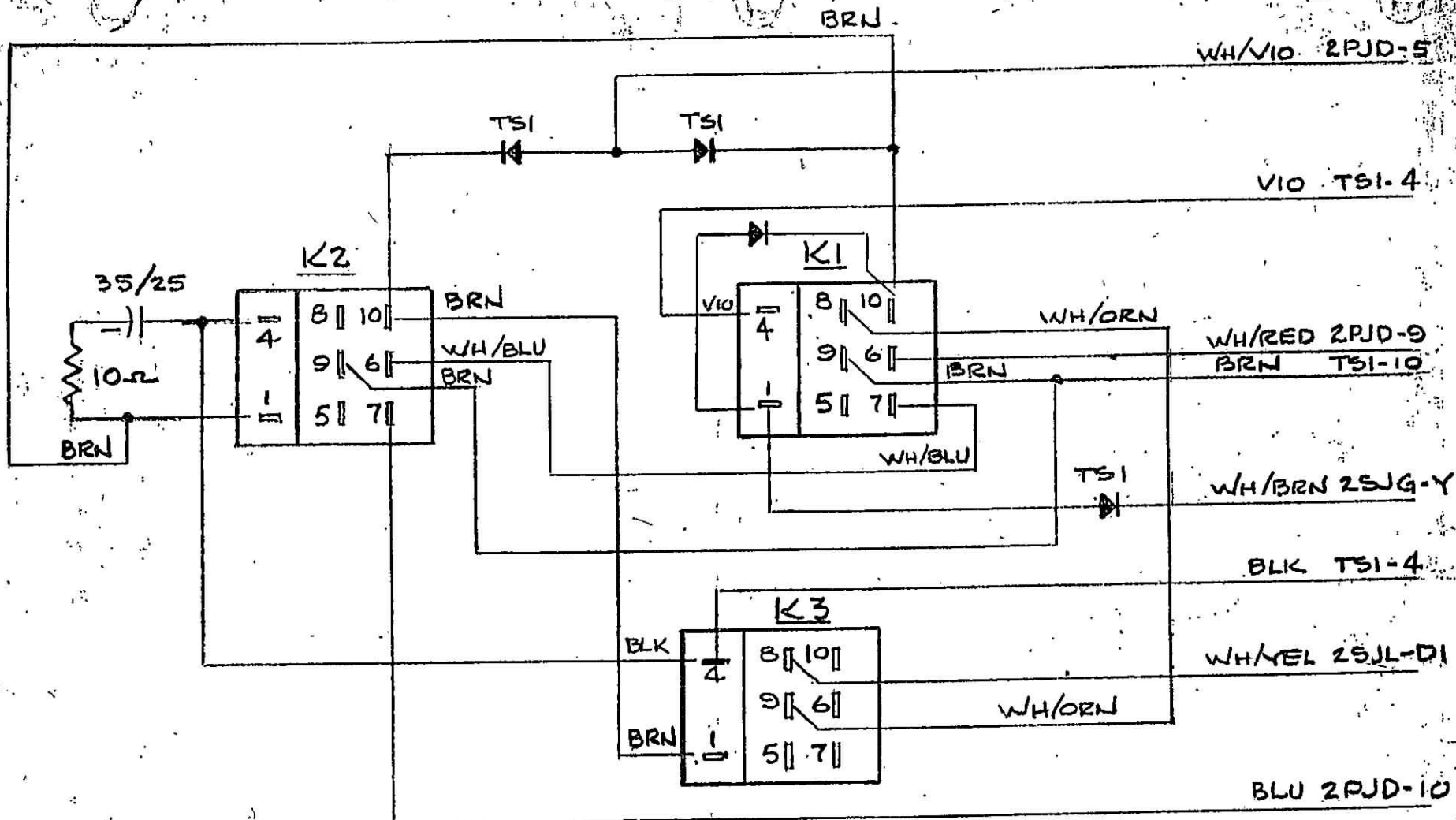
DATE: 20 APR 78

REVISED

SCHEMATIC - C10196 CARD
REGULATOR BOARD - POWER SUPPLY

MODEL 821 B-24-QII

DRAWING NUMBER



STEPHENS ELECTRONICS, INC.

SCALE: —

APPROVED BY:

DRAWN BY GIER

DATE: 20 APR 78

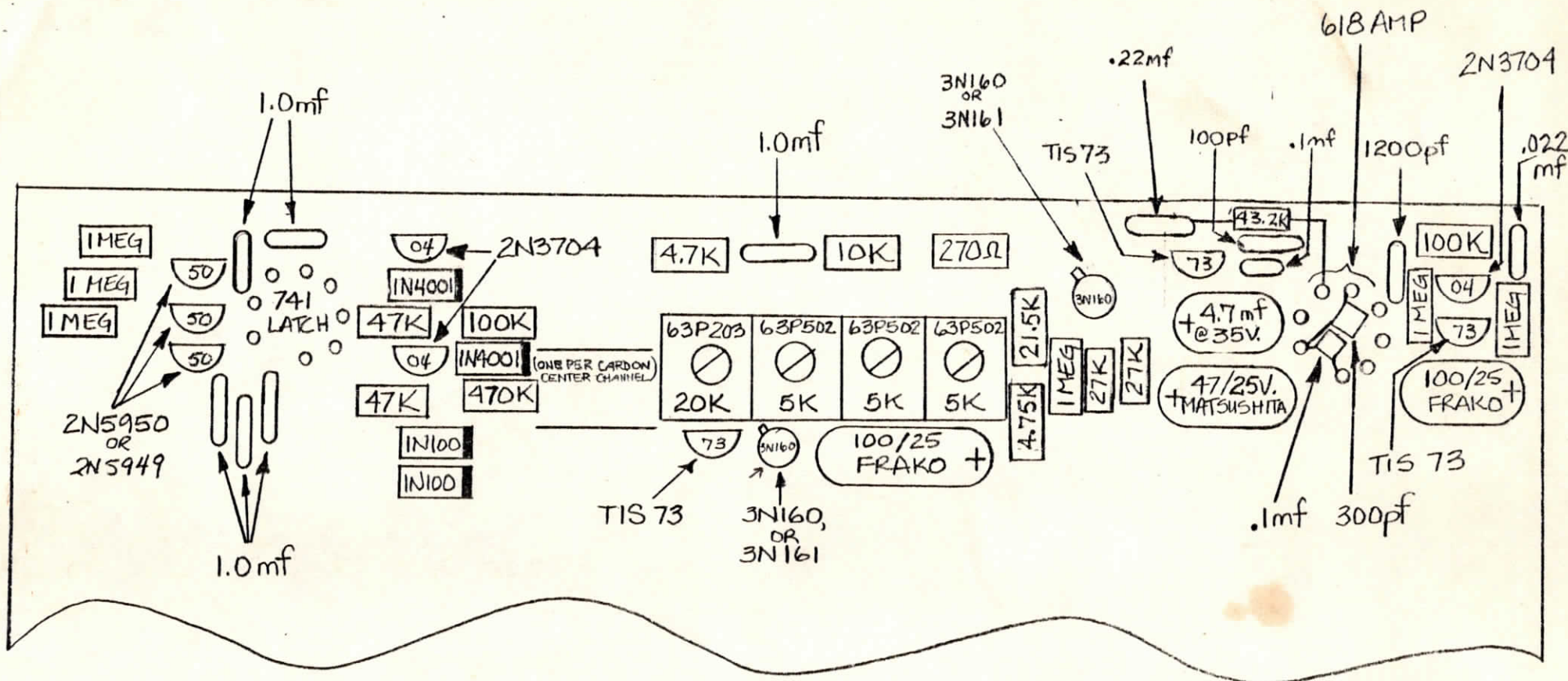
REVISED

INTERCONNECTION DIAGRAM
RELAYS

MODEL 821B-24-OT

DRAWING NUMBER





STEPHENS ELECTRONICS

SCALE:

APPROVED BY:

DRAWN BY GD

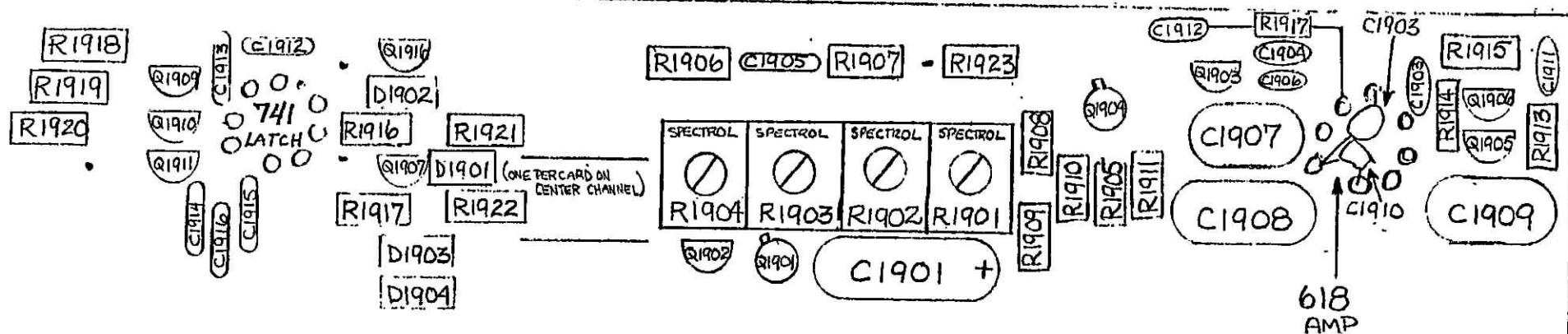
DATE: 13 MAY 80

REVISED 7-80 DC

LINE AMPLIFIER 310159C
LAYOUT BY PART VALUE

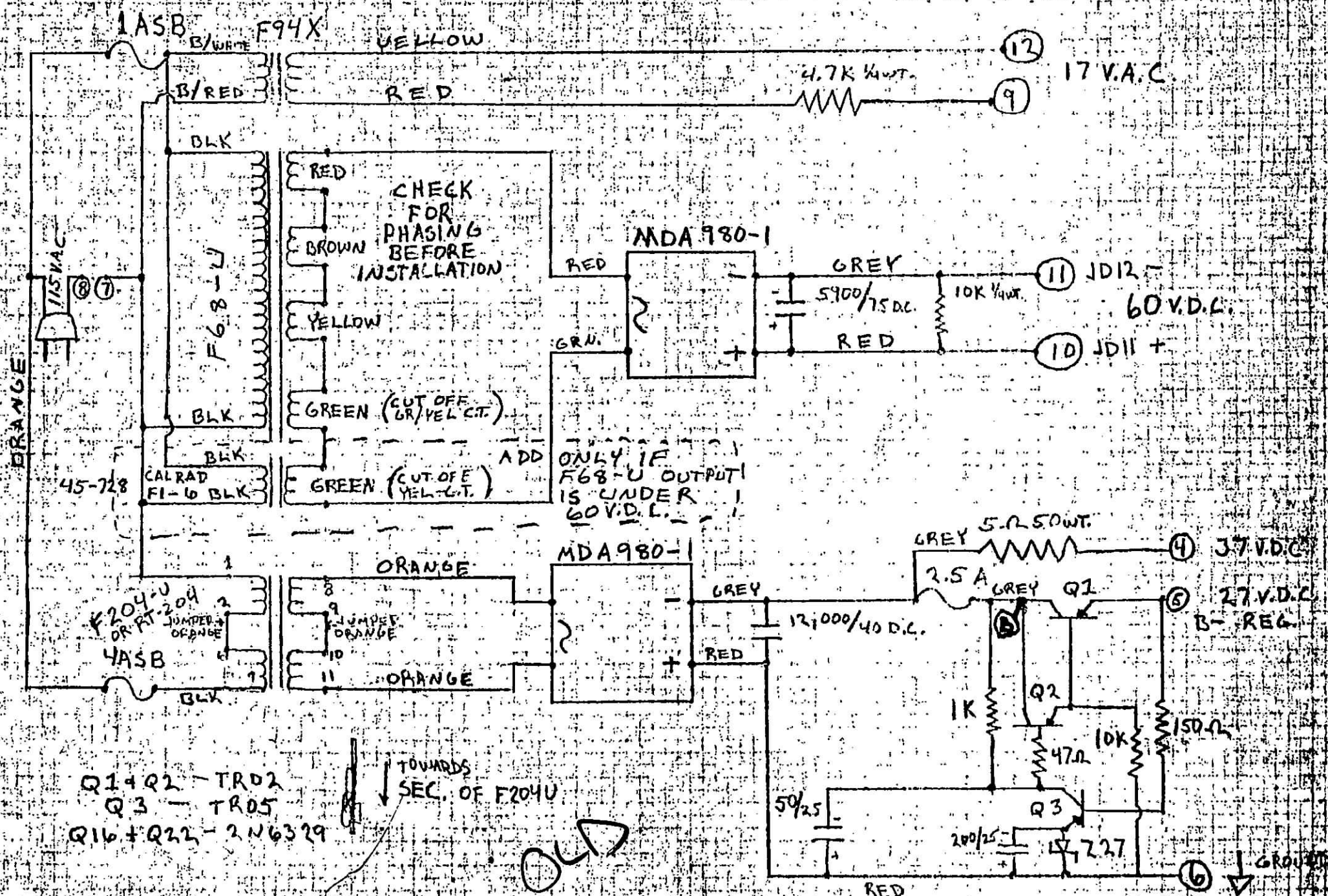
DRAWING NUMBER

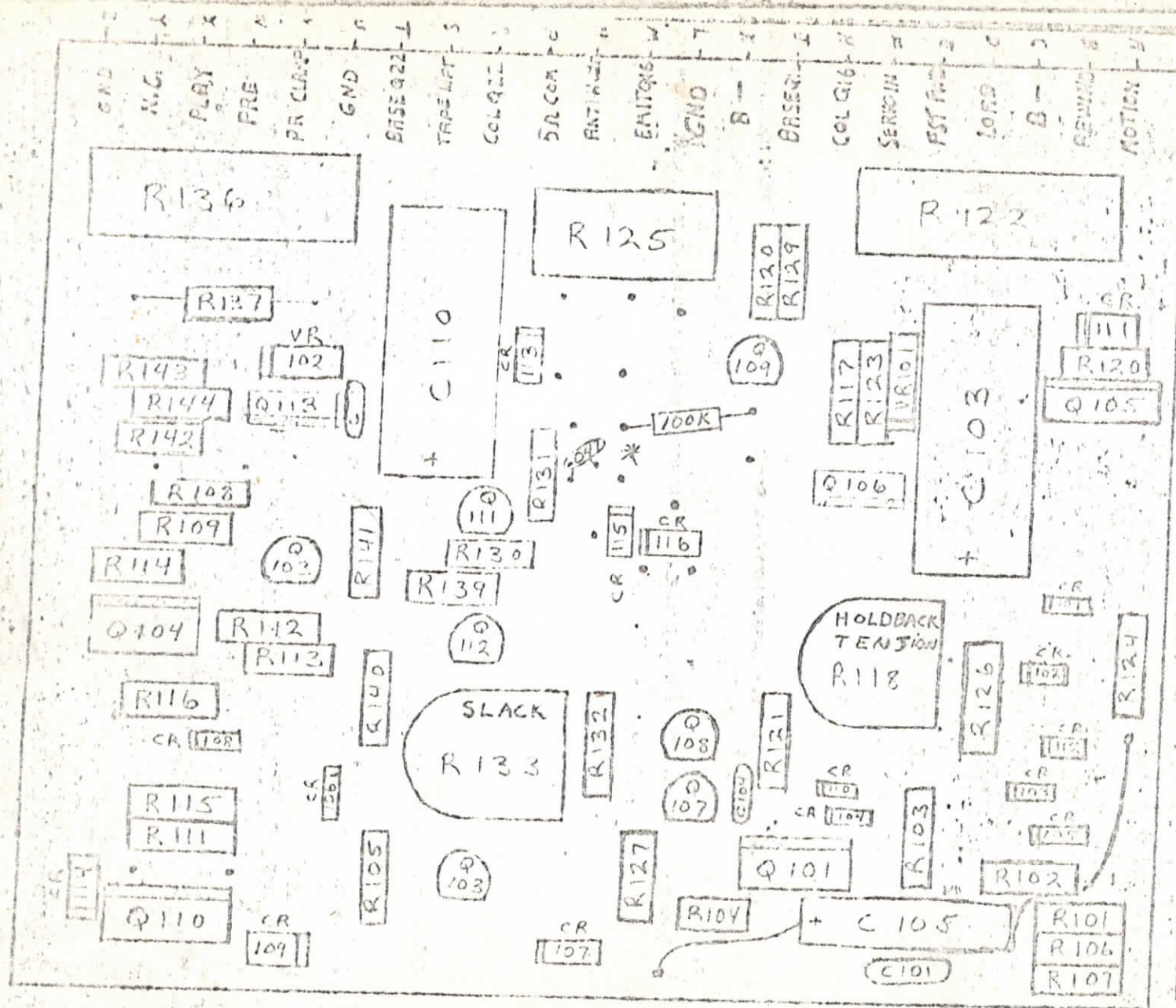
STEPHENS ELECTRONICS
LINE AMPLIFIER 310159C 7/80



1/11/74

CIRCLED NUMBERS (1) ARE
DRAWING REFERENCE NUMBERS





PAST MODIFICATION PARTS IN RED,
NO LONGER USED ON NEW MACHINES
CHECK SECOND PAGE FOR PRESENT
FORMAT

STEPHENS ELECTRONICS, INC.

SCALE: 2:1

APPROVED BY:

DRAWN BY:

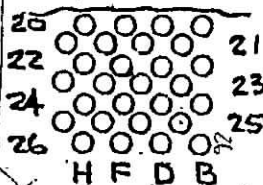
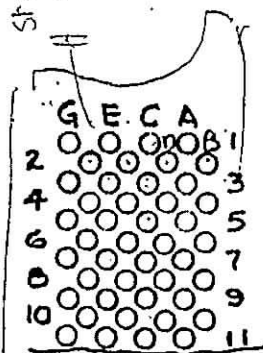
DATE: 10/10/74

Anti-bruit mod.

DESIGNED BY:

4/7/77

Side of
connector



AMPHENOL

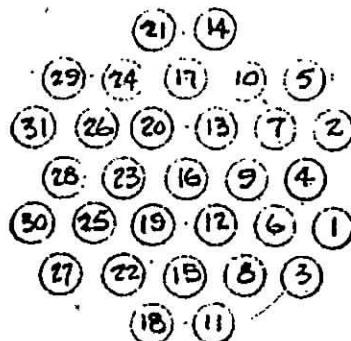
SERIES 220 104 series

Back of male,

ZN104

A C E G = ODD

B D F H = EVEN



AMPHENOL

SERIES 222

1	2	3
4	5	6
7	8	9
10	11	12

API

SERIES 1-480XXX-0

STEPHENS ELECTRONICS, INC.

SCALE:

APPROVED BY:

DRAWN BY G. Sier

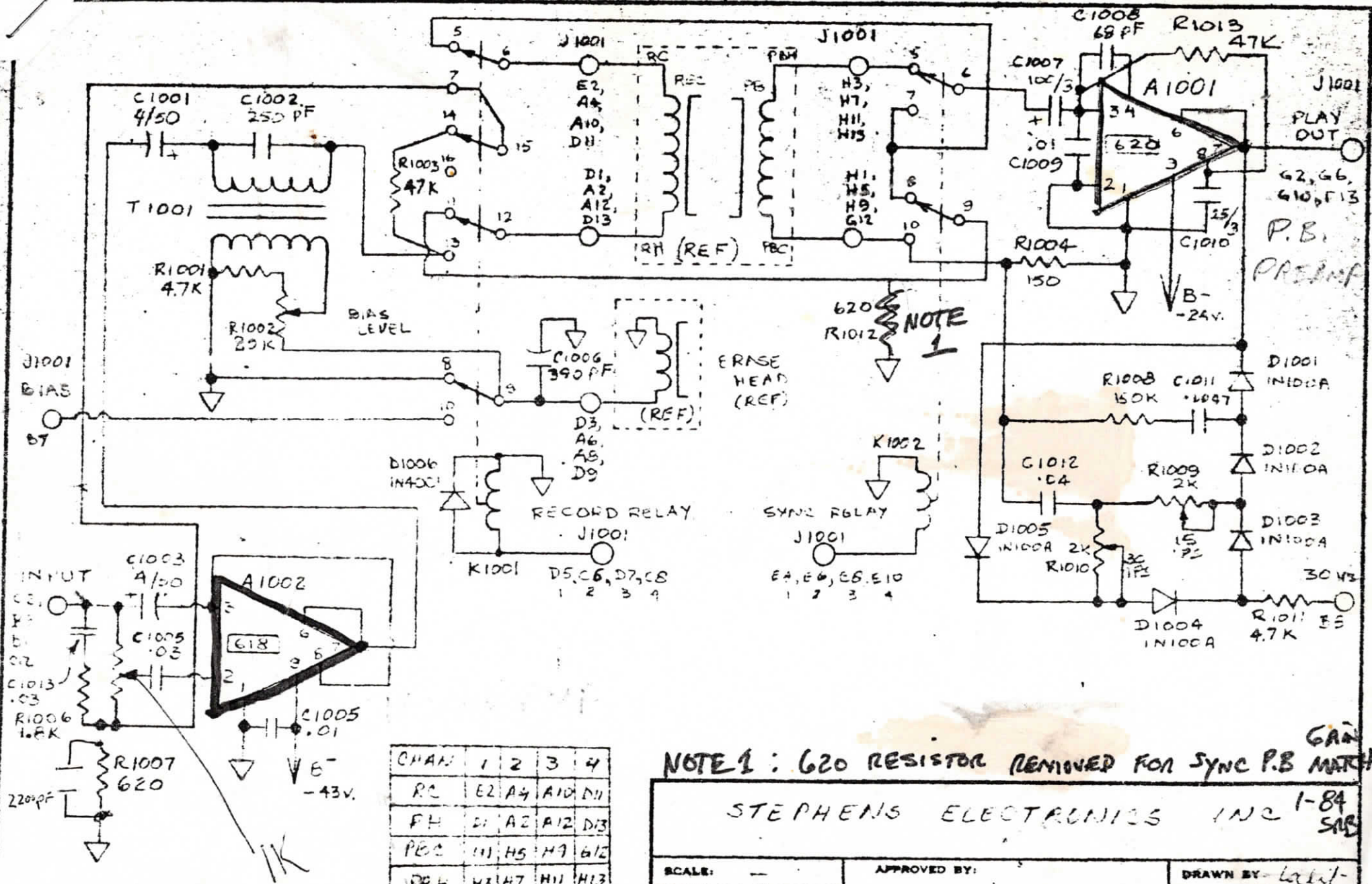
DATE: 24/APR/78

REVISED

CONNECTOR PIN CONFIGURATIONS

MODEL 821B-24-QII

DRAWING NUMBER



CHAN	1	2	3	4
RC	E2	A4	A10	D11
PH	D1	A2	A12	D13
PBC	H1	H5	H7	G12
REF	H3	H7	H11	H13
E	D3	A6	A8	D9

AMPLIFIER COMPL.
PIN NUMBERS
CARRYING SIGNAL
TO HEAD STACK

NOTE 1: 620 RESISTOR REMOVED FOR SYNC P.B. MATCH

STEPHENS ELECTRONICS INC 1-84
SAB

SCALE: —

APPROVED BY:

DRAWN BY: LAL/

DATE: 6/6/75

REVISED 3/2/75

PRE AMP ELECTRONICS

811-D 3100

DRAWING NUMBER

110912-C

9/23/85

NEW STEPHENS ALIGNMENT

Playback: - 1K @ 0db

- 10K @ -1db (1db lower than 1K, all cases)

RECORD: ~~★~~ Have to find optimum Bias for each Batch of Tape using 15hz for test tone

- 1K @ 0db

- 10 @ 0db

- * 70 hz @ 0db sync P.B. - adjust low End Playback while in ~~sync~~ Sync

* Do all Even channels, then do all odd channels never Side by Side

★ Bias = 15hz monitor tape return NOT Buss Outputs, (Adj) Back off Bias level, slowly increase noise reduction into a nul point. Adjust fine tune the nul point. WARNING: Further increase will give a false indication of noise reduction.

STEVEN'S 24 TRK

PUNCH IN POPS

TURN ON TRANSISTOR
SIDE OF
ONLINE. BIAS CARD

ADD 10-20 μ TO THE

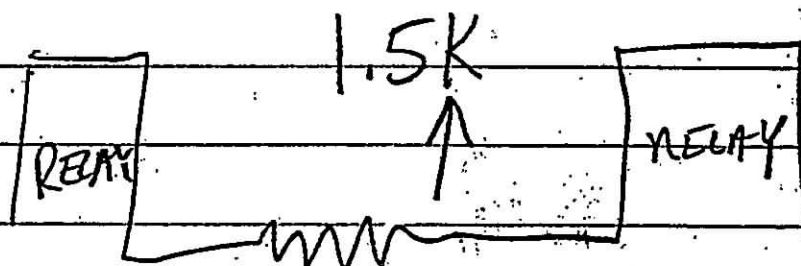
47 μ UP A CROSS
THE CARD. THIS WILL
SLOW DOWN THE TURN ON

TO SLOW DOWN THE
TURN OFF ADD APPROX .5K

TO THE 1.0K RESISTOR

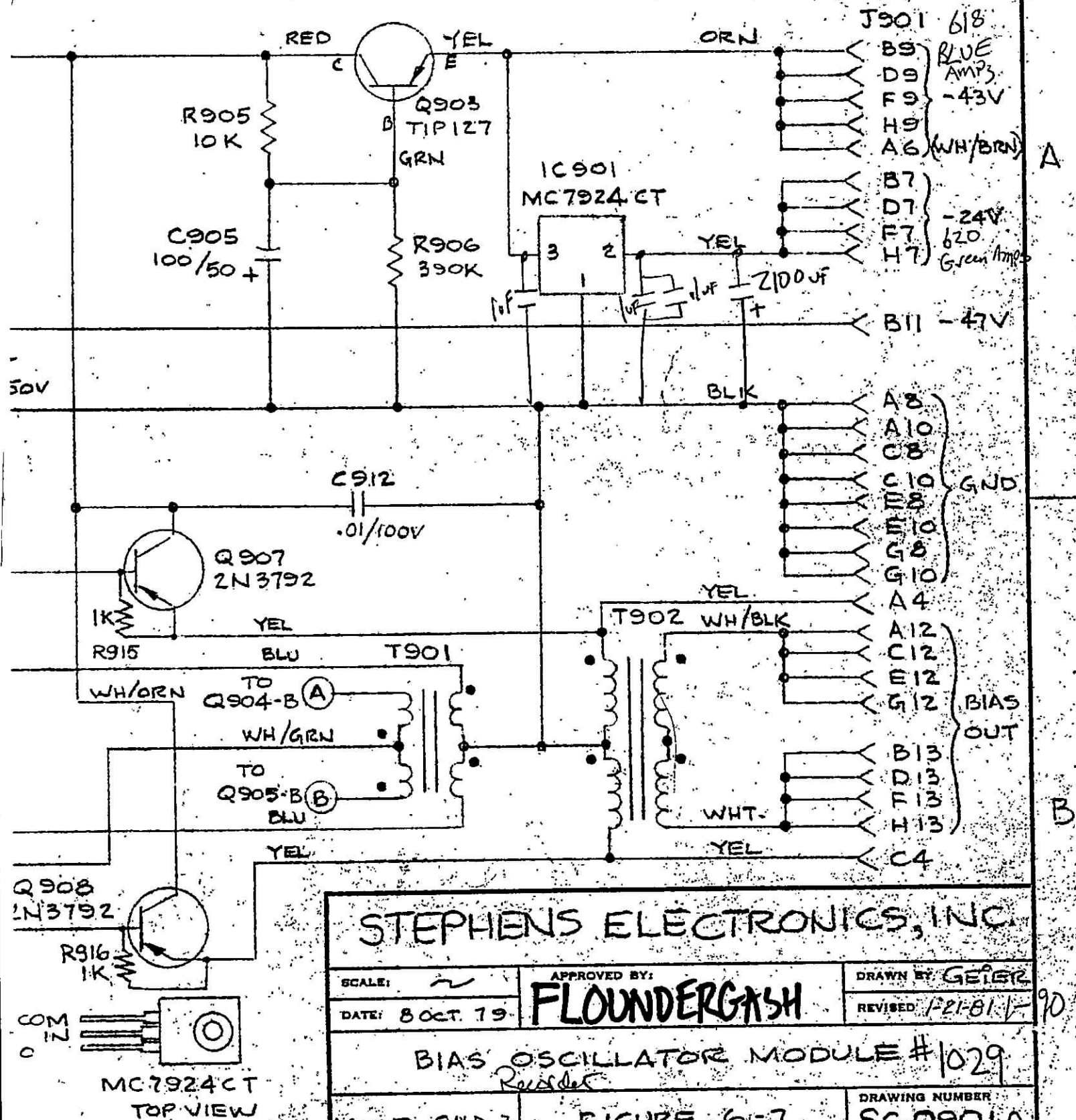
CROSS THE ADJACENT
RELAYS ON THE UNDER-
SIDE OF THE DECK.

OVER \rightarrow



REVISIONS

LTR	DESCRIPTION	DATE	BY
A	WAS DWG. NO. 110902-C MODEL WAS B21B, REMOVE R913, R914 R911 WAS 1.5K C909 WAS 25/50V	1-23-81	B. CLARK



STEPHENS ELECTRONICS, INC.

SCALE:

APPROVED BY:

DRAWN BY: GELER

DATE: 8 OCT. 79

APPROVED BY:
FLOUNDERGASH

REVISED 1-21-81

BIAS OSCILLATOR MODULE # 029

MODEL BND

FIGURE 6-7

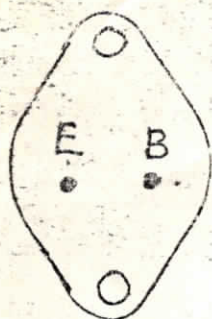
DRAWING NUMBER

SC-0901A

FLOUNDERGASH 6/89

POWER TRANSISTORS

BLACK HOT
SHIELD

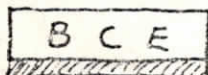


BOTTOM VIEW

FRONT VIEW

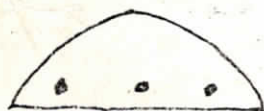


BCE

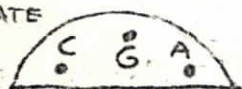
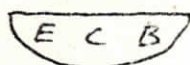


BOTTOM VIEW

TYPE	POLARITY	+ LEAD	- LEAD	RESISTANCE
TR02	PNP	E	B	22 Ω
		E	C	22 Ω
2N3792	PNP	B	C	65 Ω
		B	E	65 Ω
2N6329				
TIP29		C	B	65 Ω
		E	B	65 Ω
TIP30	PNP	B	C	65 Ω
		B	E	65 Ω
TIP42		B	C	65 Ω
		B	E	65 Ω
TIP121 (120)		C	B	69 Ω
		C	E	61 Ω
		E	B	122 Ω
TIP125		B	C	71 Ω
		B	E	130 Ω
TIP127		B	C	71 Ω
		B	E	130 Ω
2N3702	PNP	B	C	45 Ω
		B	E	45 Ω
2N3704	NPN	C	B	45 Ω
		E	B	45 Ω
2N3707	NPN			
TR05				
2N3819	FET	D S S	S D G	(X100 SCALE) 200 Ω 3K Ω
TIS73	FET	D S S	S D G	20 Ω 55 Ω
TIC45	SCR	C	G	60 Ω
3N160				

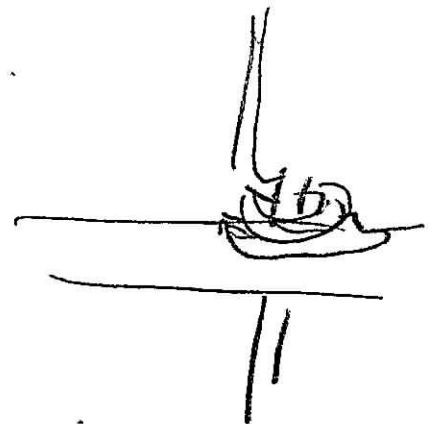
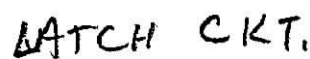


BOTTOM VIEWS



Stephens 821 A
4400 line amp.
card.

Lower's R40's
effective reaction
thus causing more
current to flow
than Q17 Base,
2N3702 thus
turning it
on harder.
if it turns
turns on Q16
harder which
keeps Q17
base on



821B Power Supply ?

Top View

SLOW BLOW

2.5AS.B. 1.5AS.B. 4AS.B.
23.86V

F101

F103

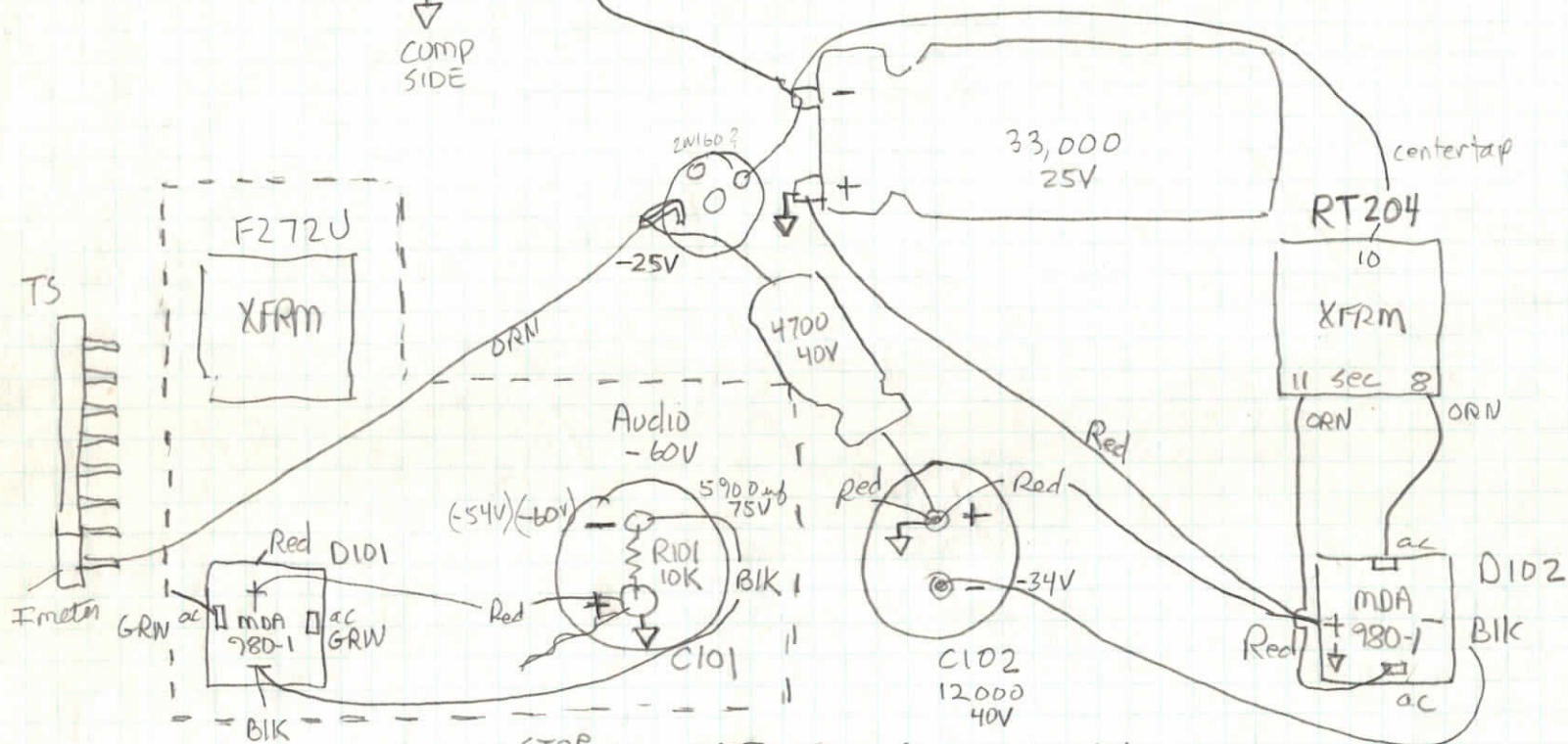
F102

SOLDER SIDE

Pin 1 2 3 4 5 6 7 8 9 10



COMP SIDE



STOP	Q104
2N	6326

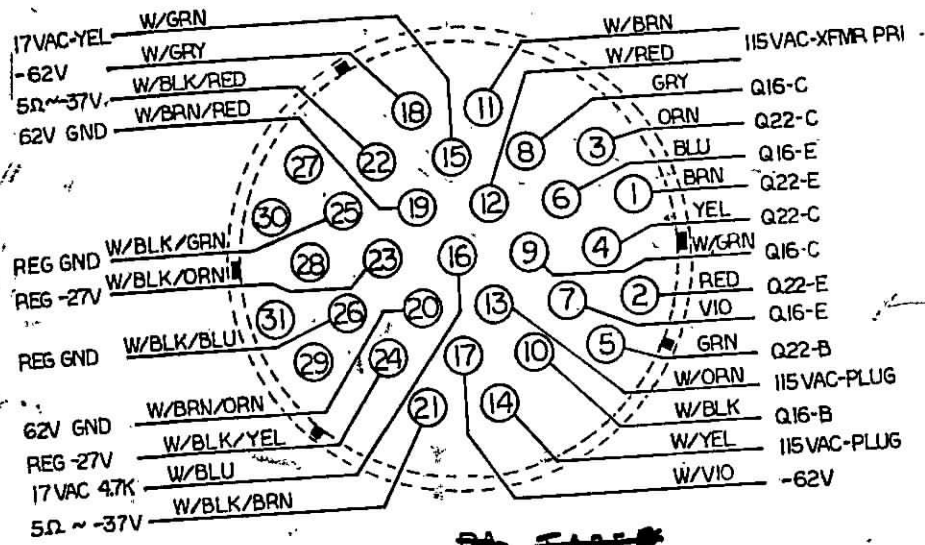
Dale
15Ω 3%
25W
R104

2N	6326
2N	6326

2N
6329

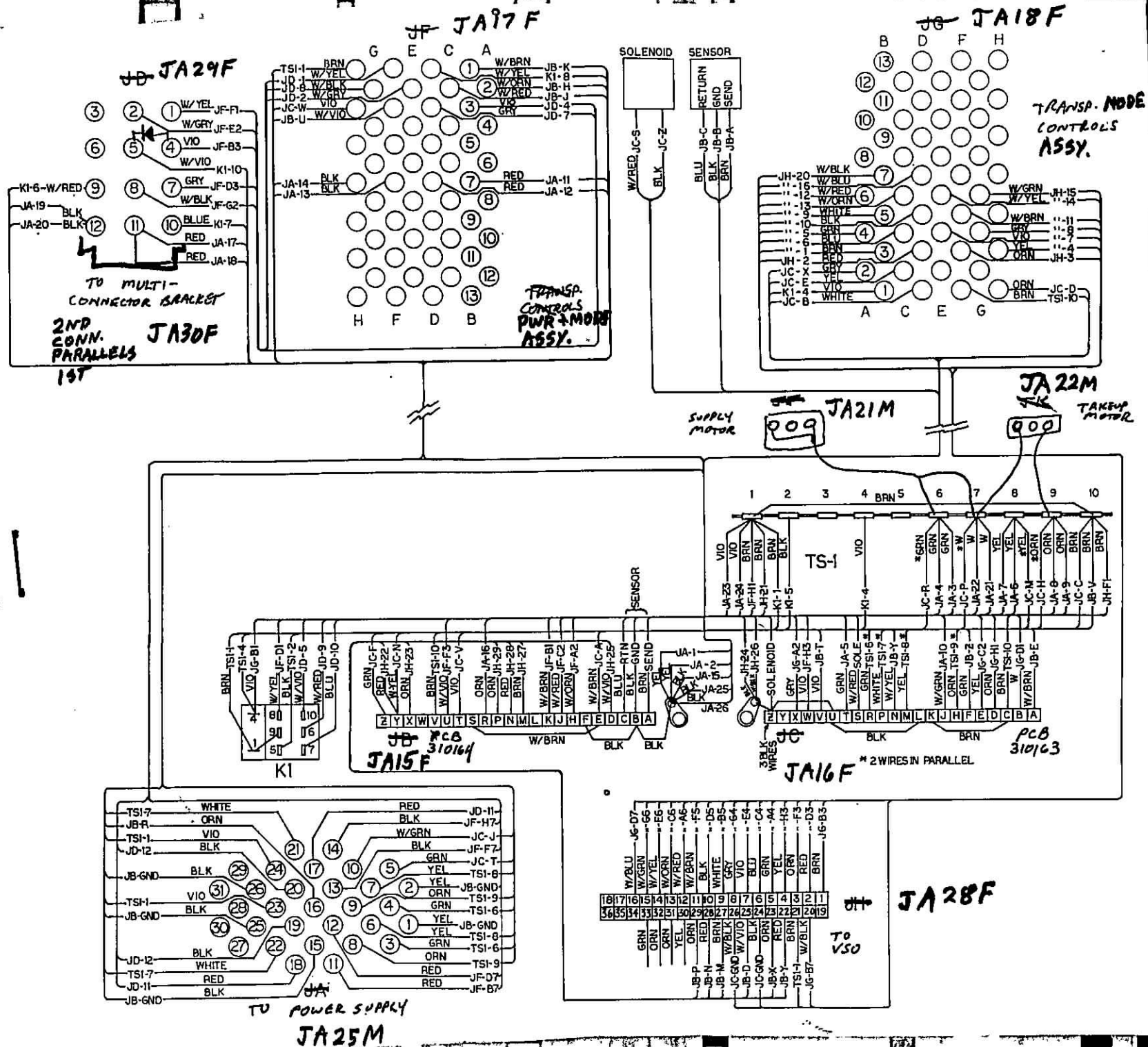
← Q102

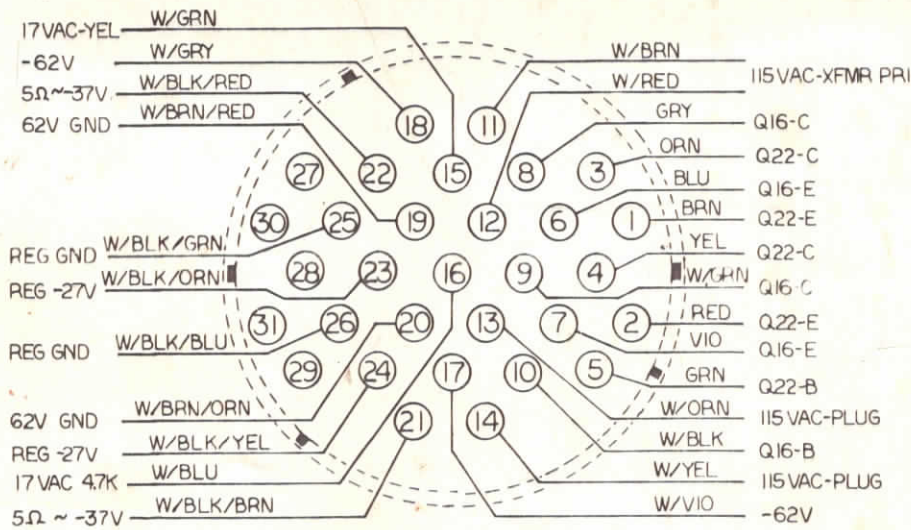
← Q101



~~PA FA25P~~
PA25F

Power Supply cable





~~PA~~ ~~FA25F~~
PA25F

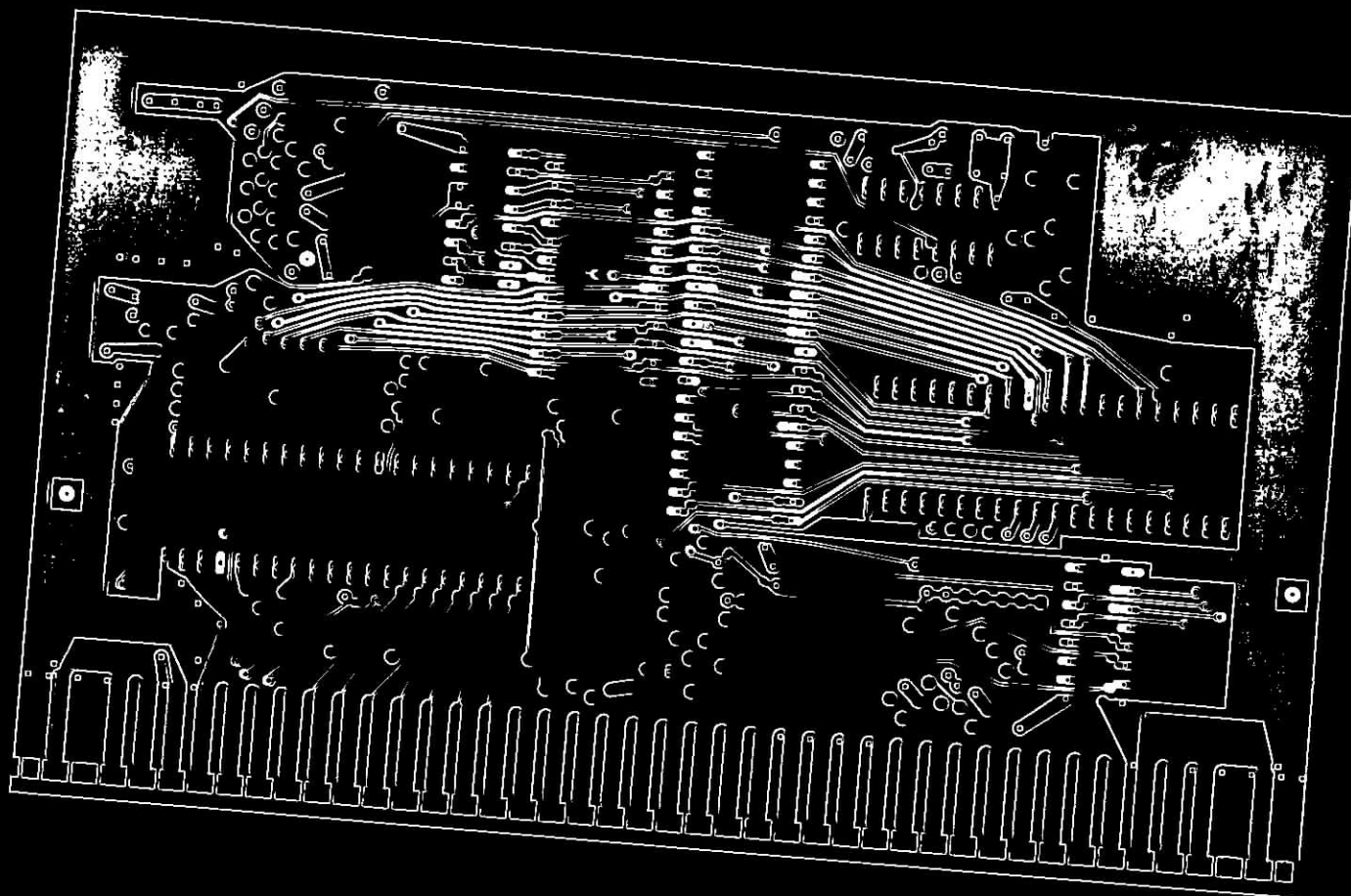
Power Supply cable

2¹¹ Lifter Assy
83-4210-0352
3m-79

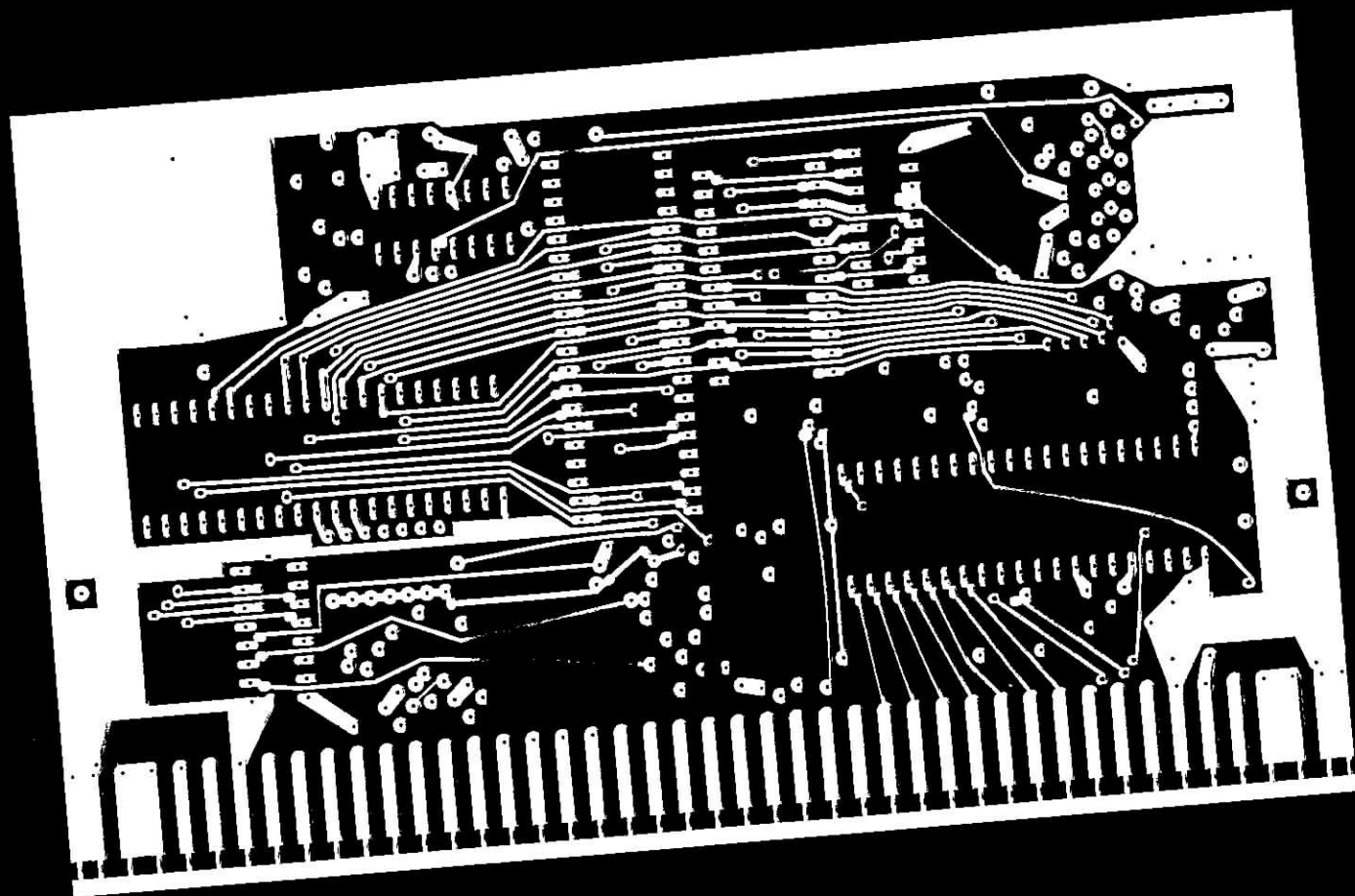
Bill Ravencliff

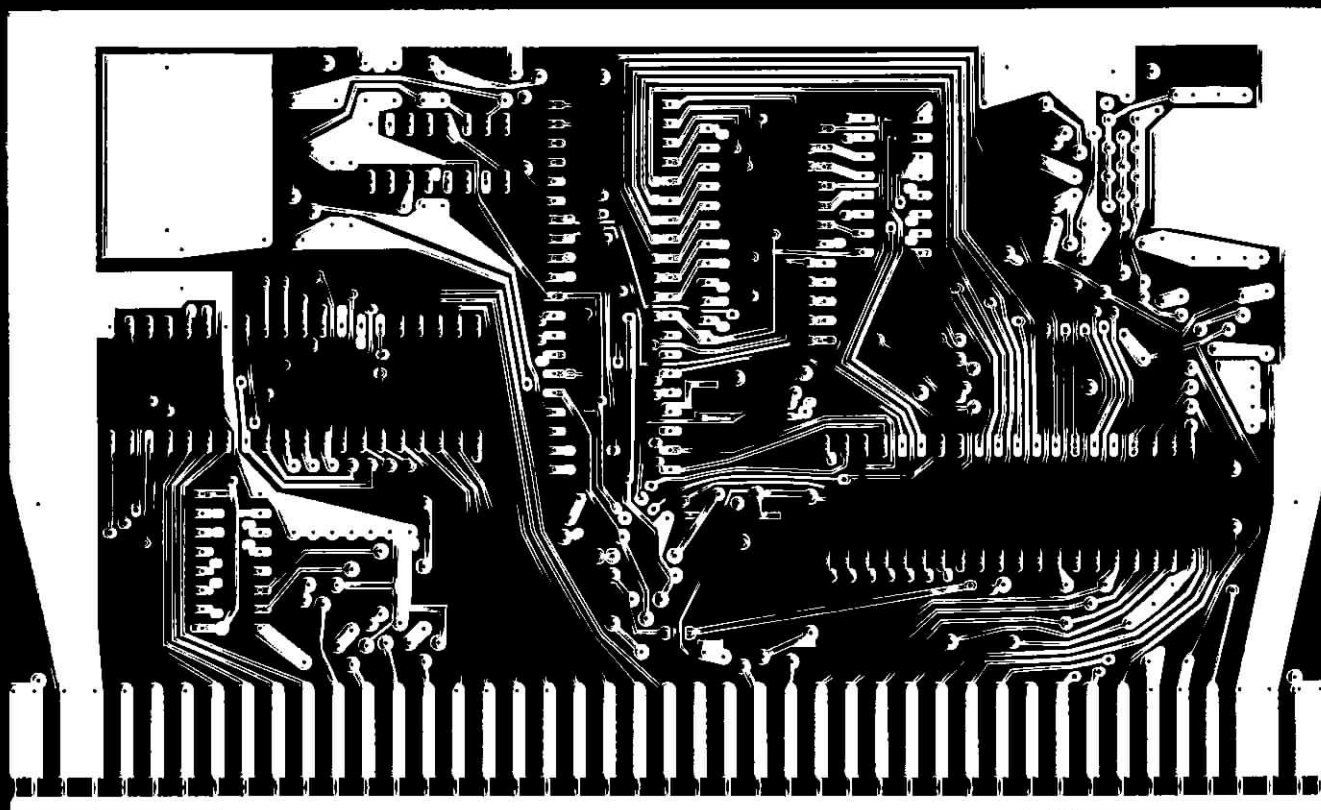
Specialist Sound
(813)

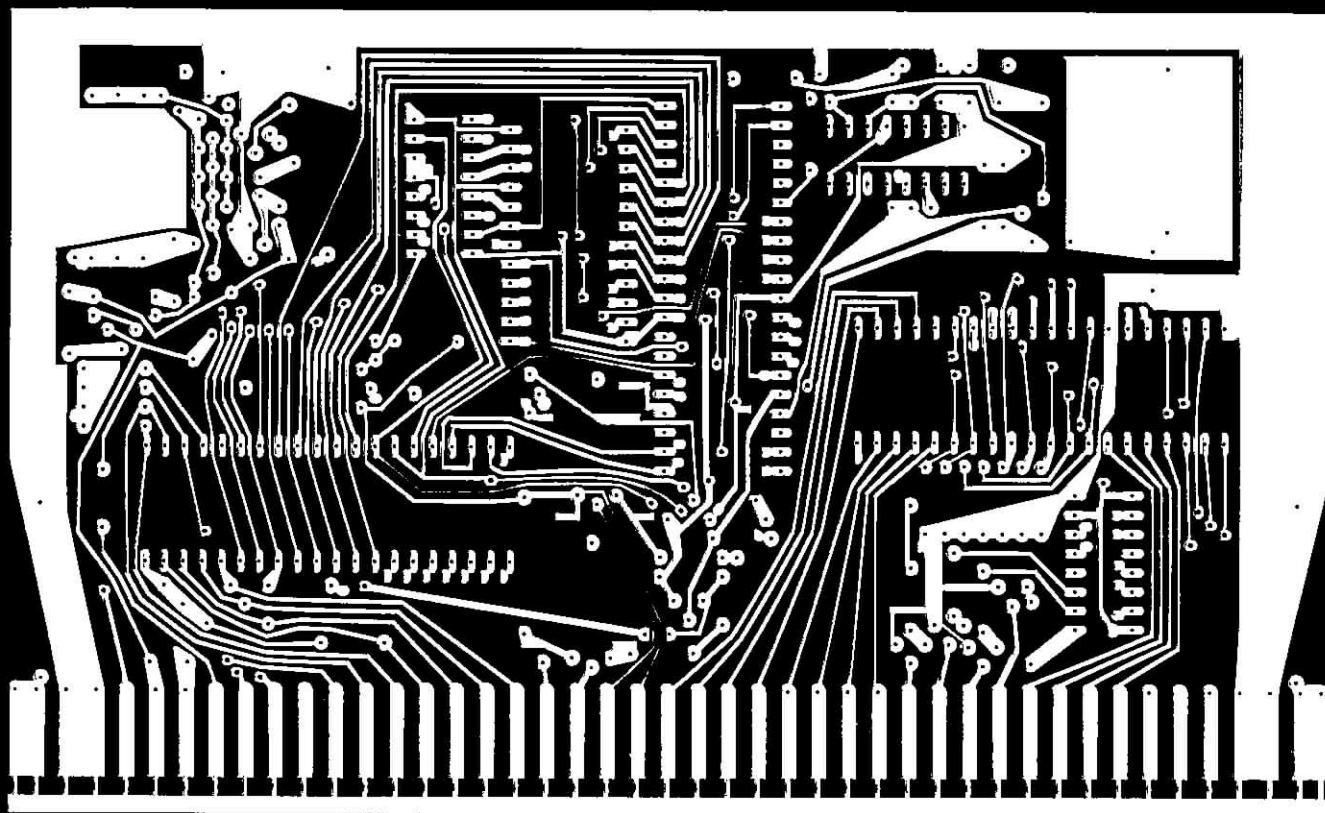
892-9810



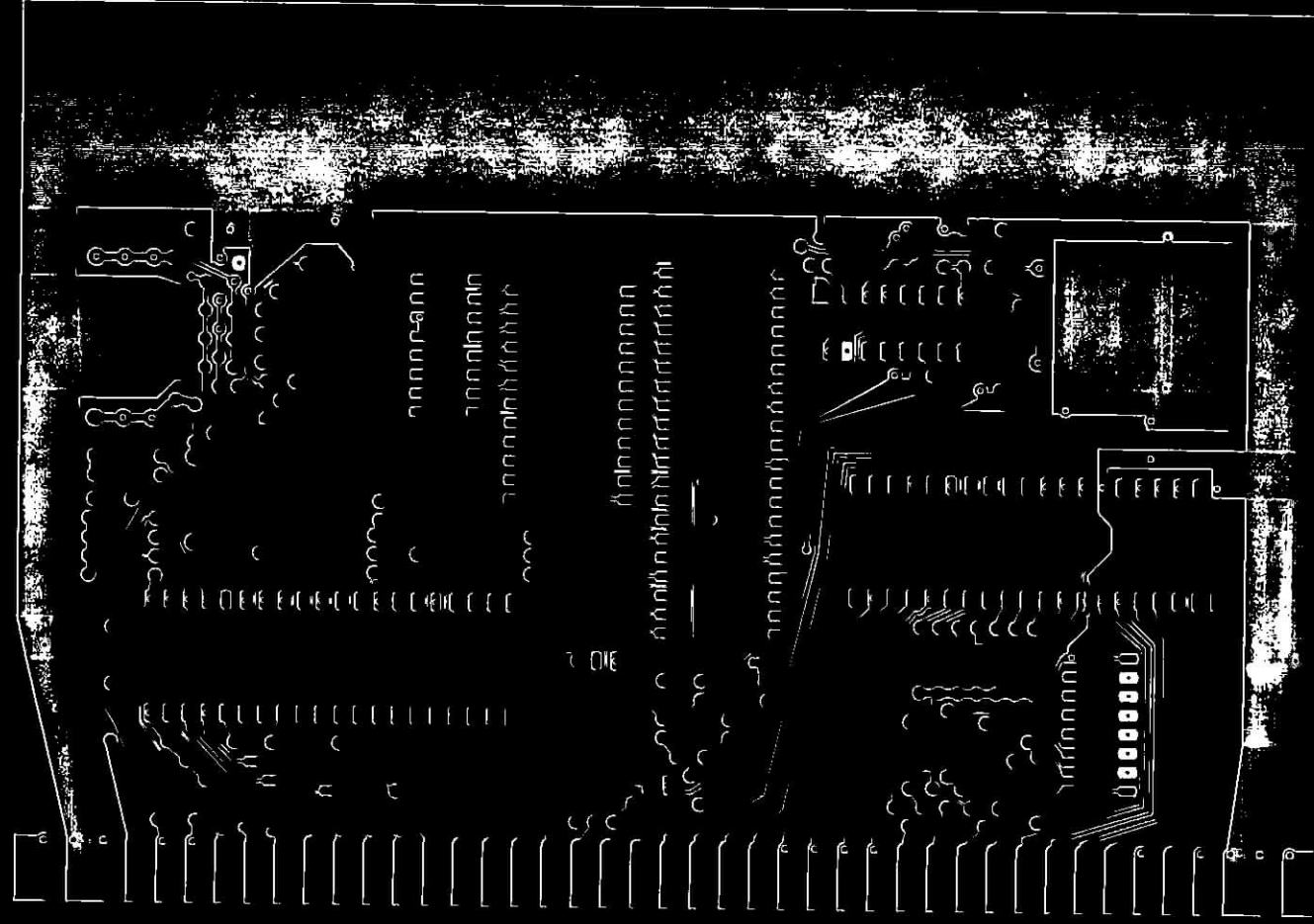
Blue

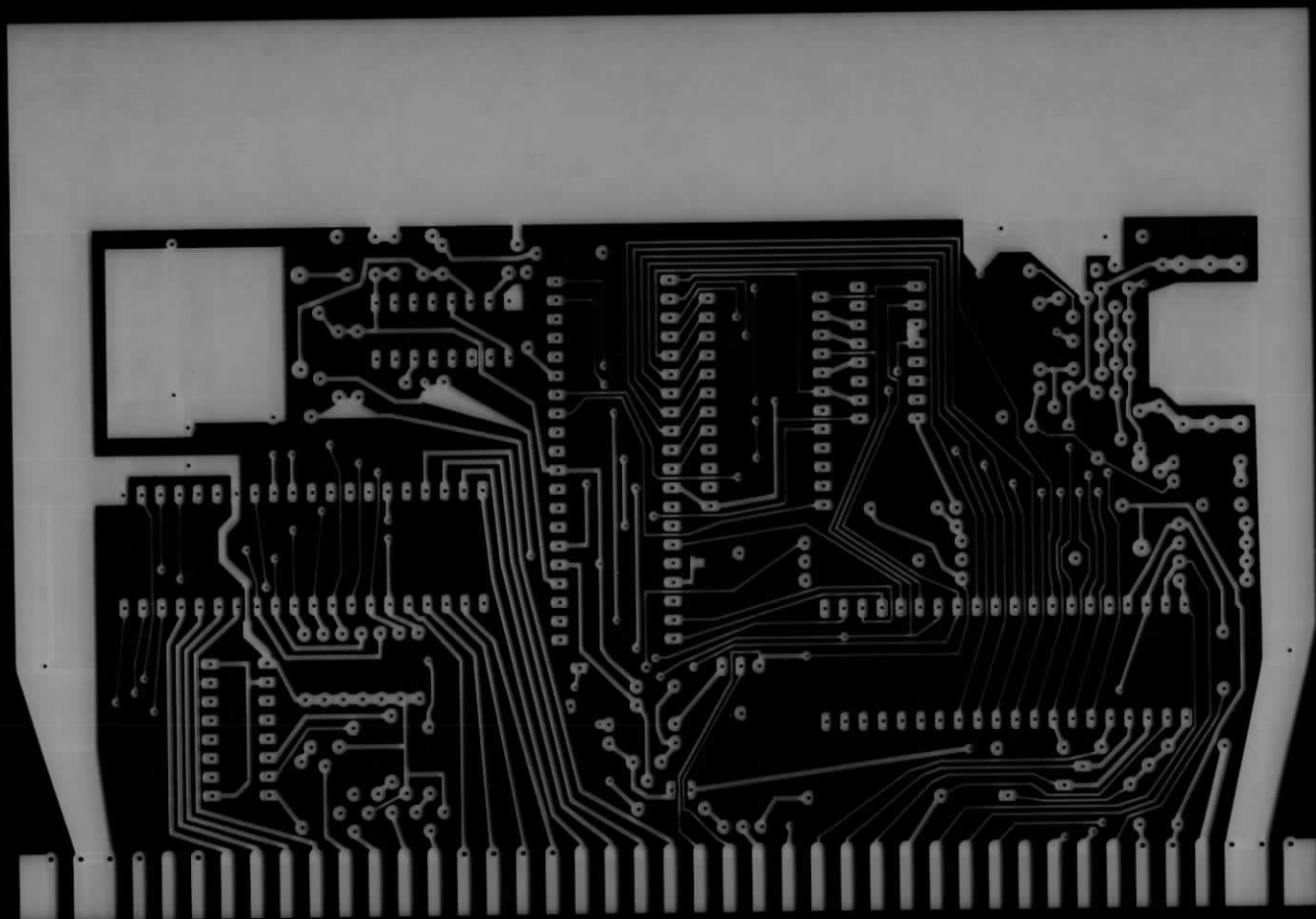


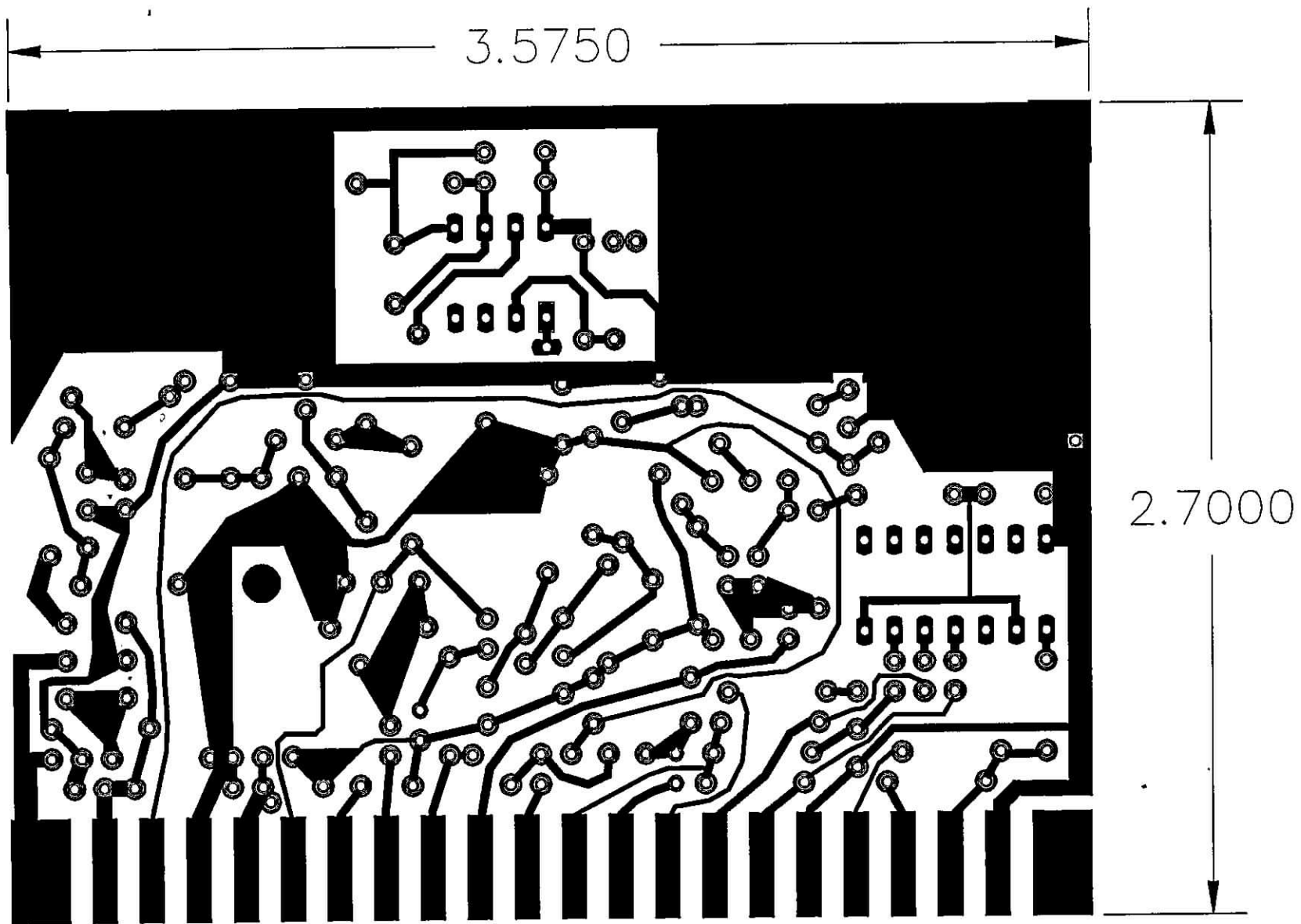




RED



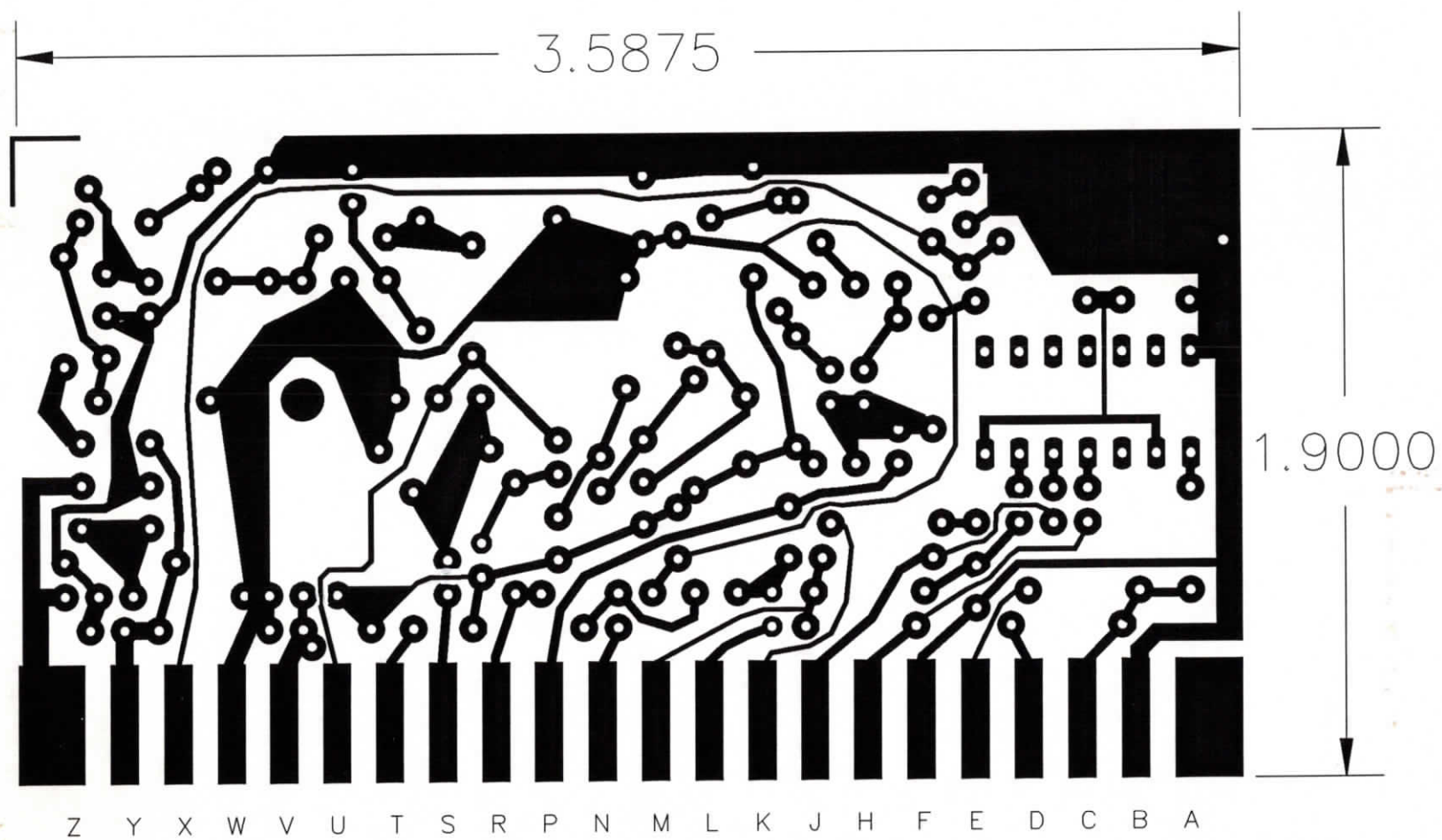


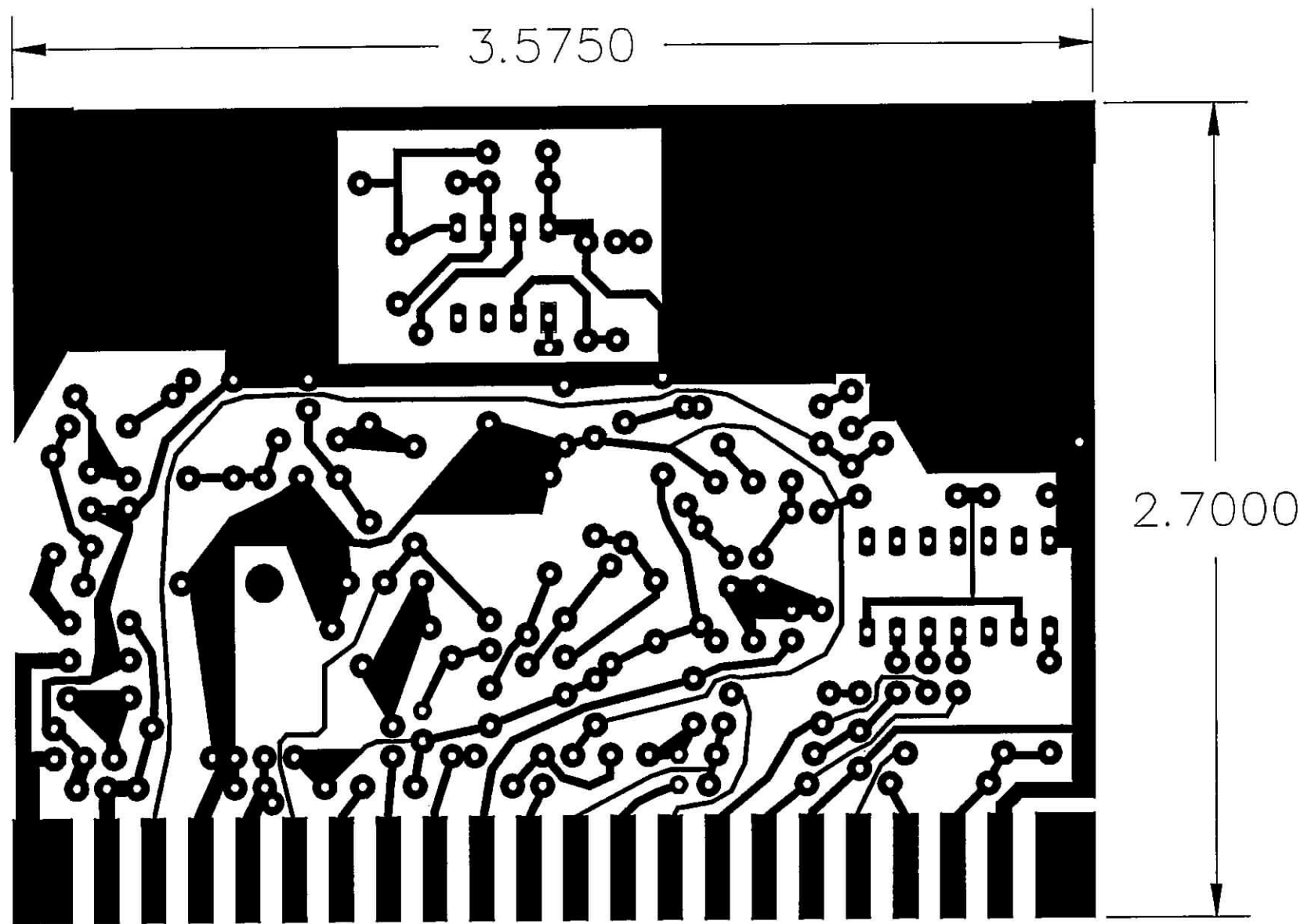


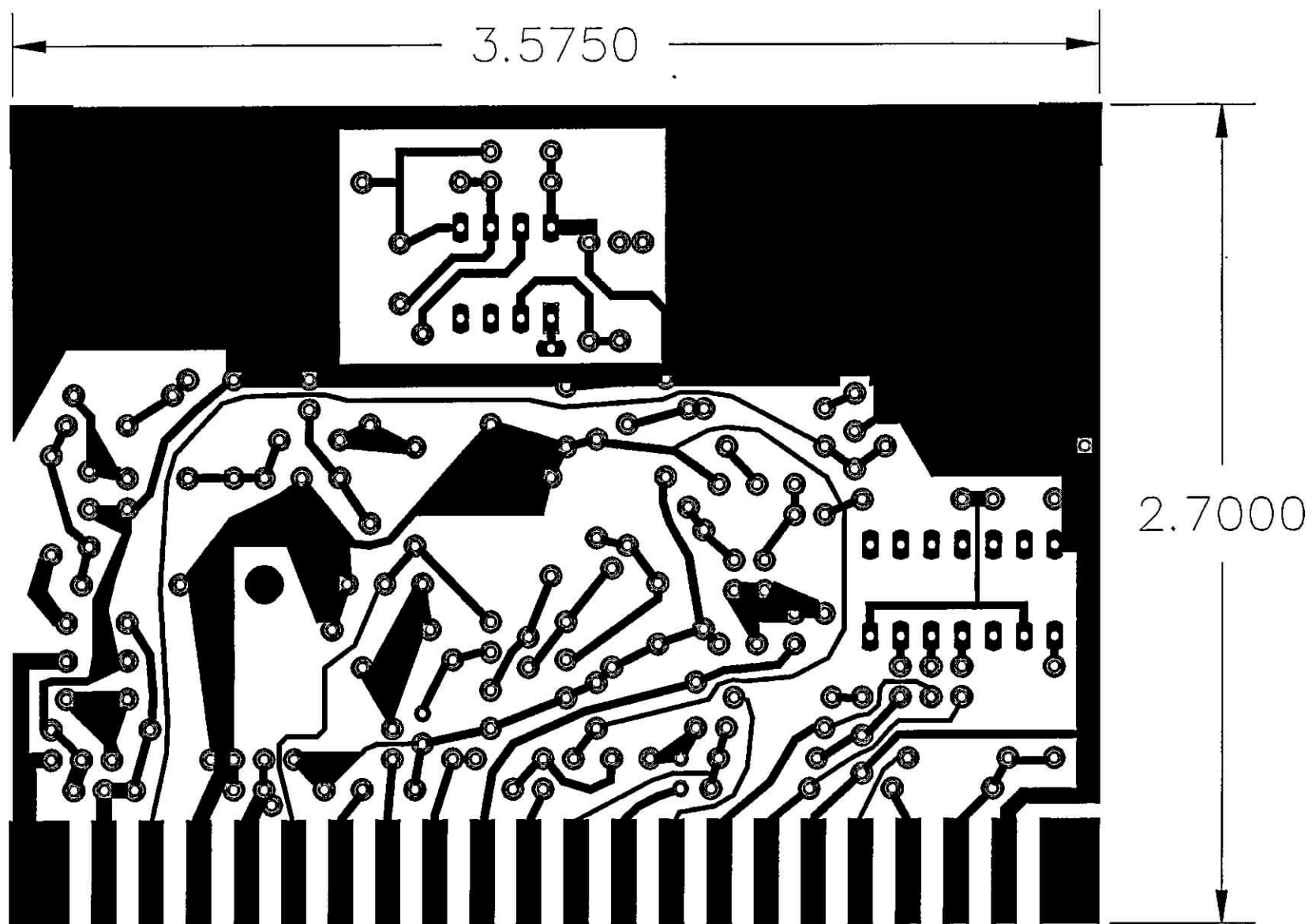


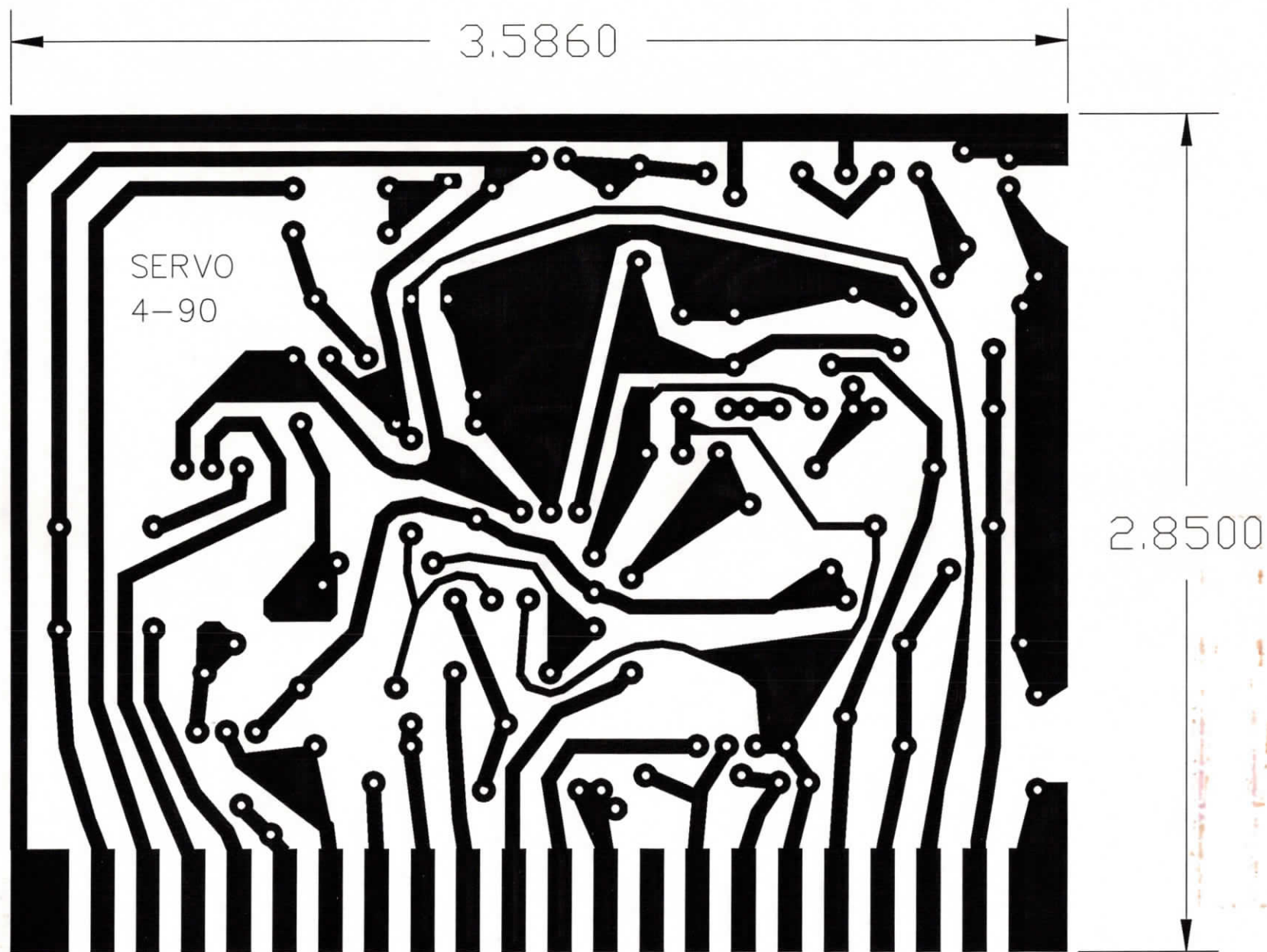
SERVO PCB
SOLDER SIDE

Emulsion Down







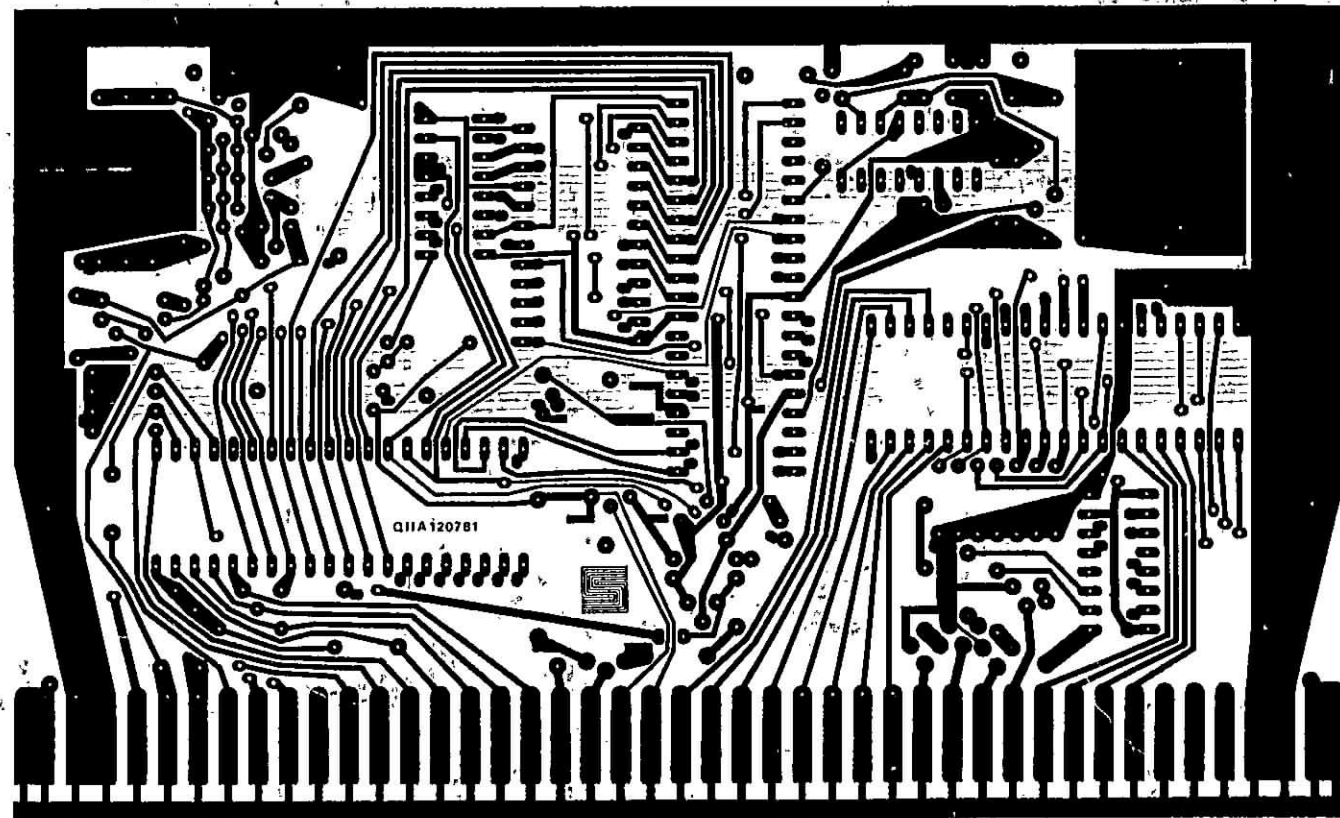


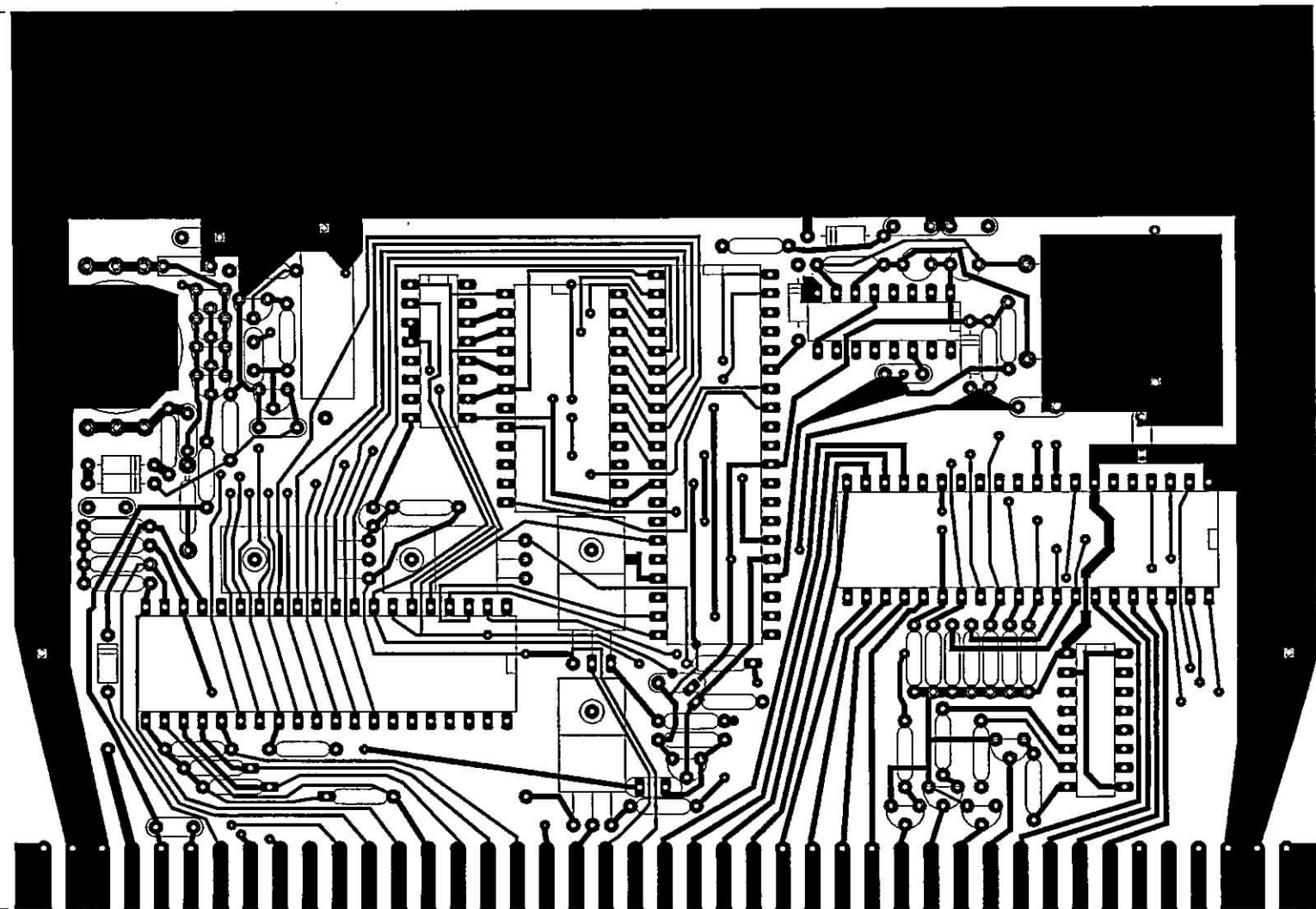


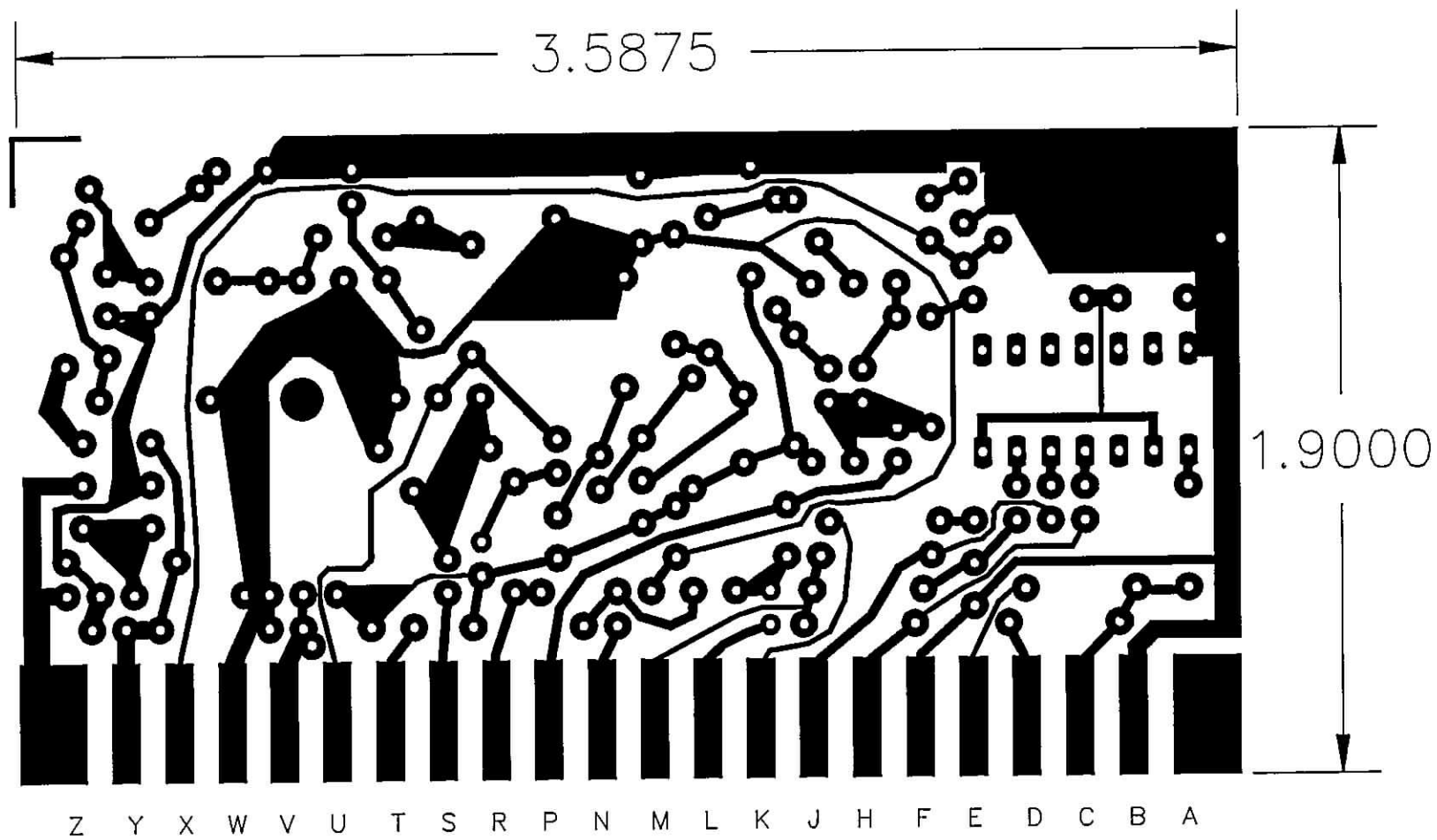
SERVO PCB
SOLDER SIDE

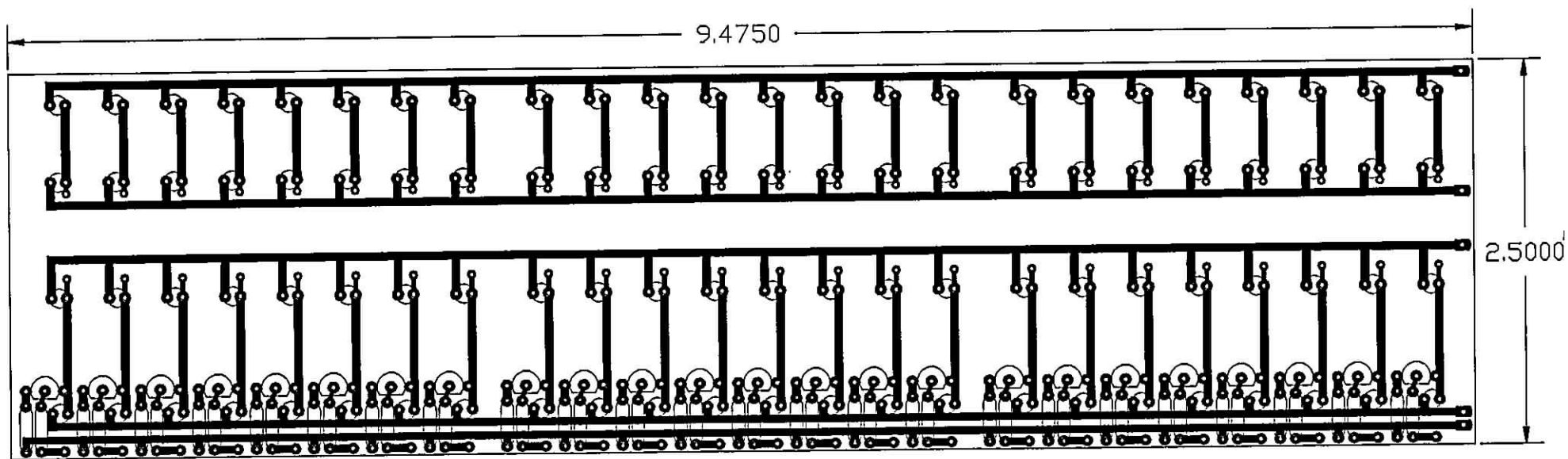
Emulsion Down

0 INCHES

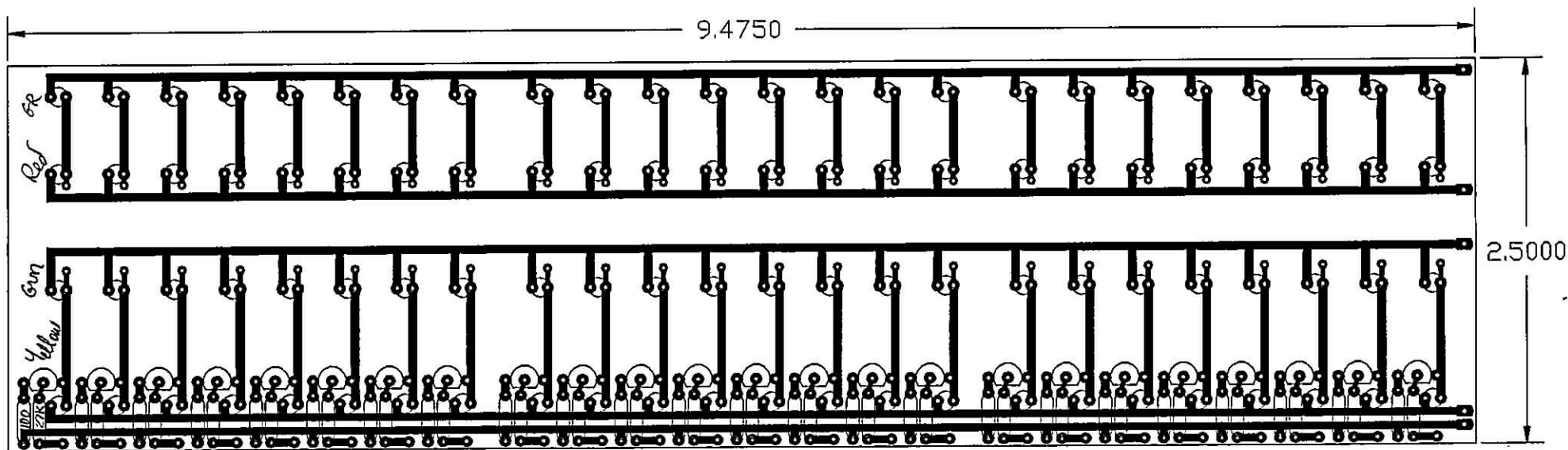


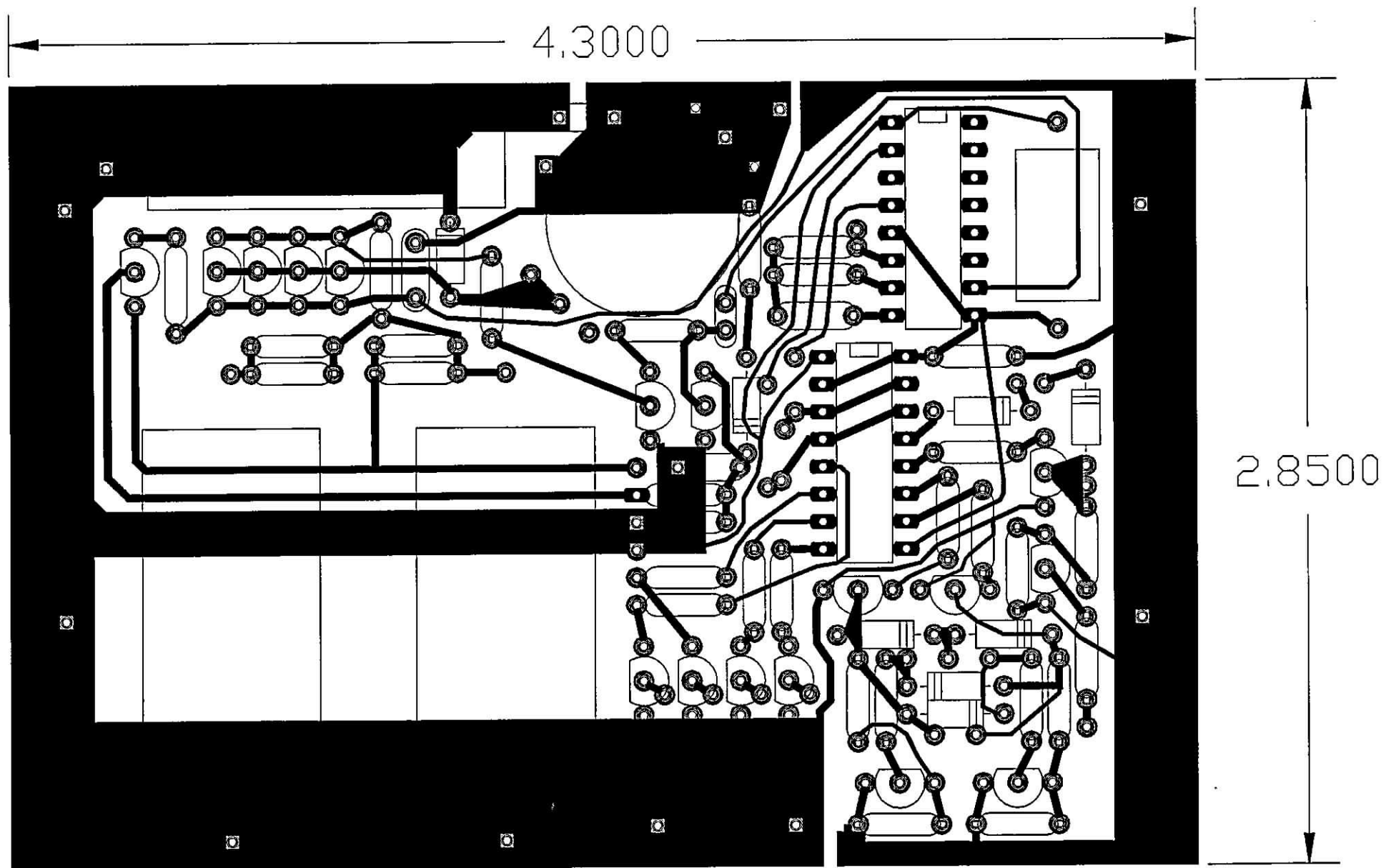


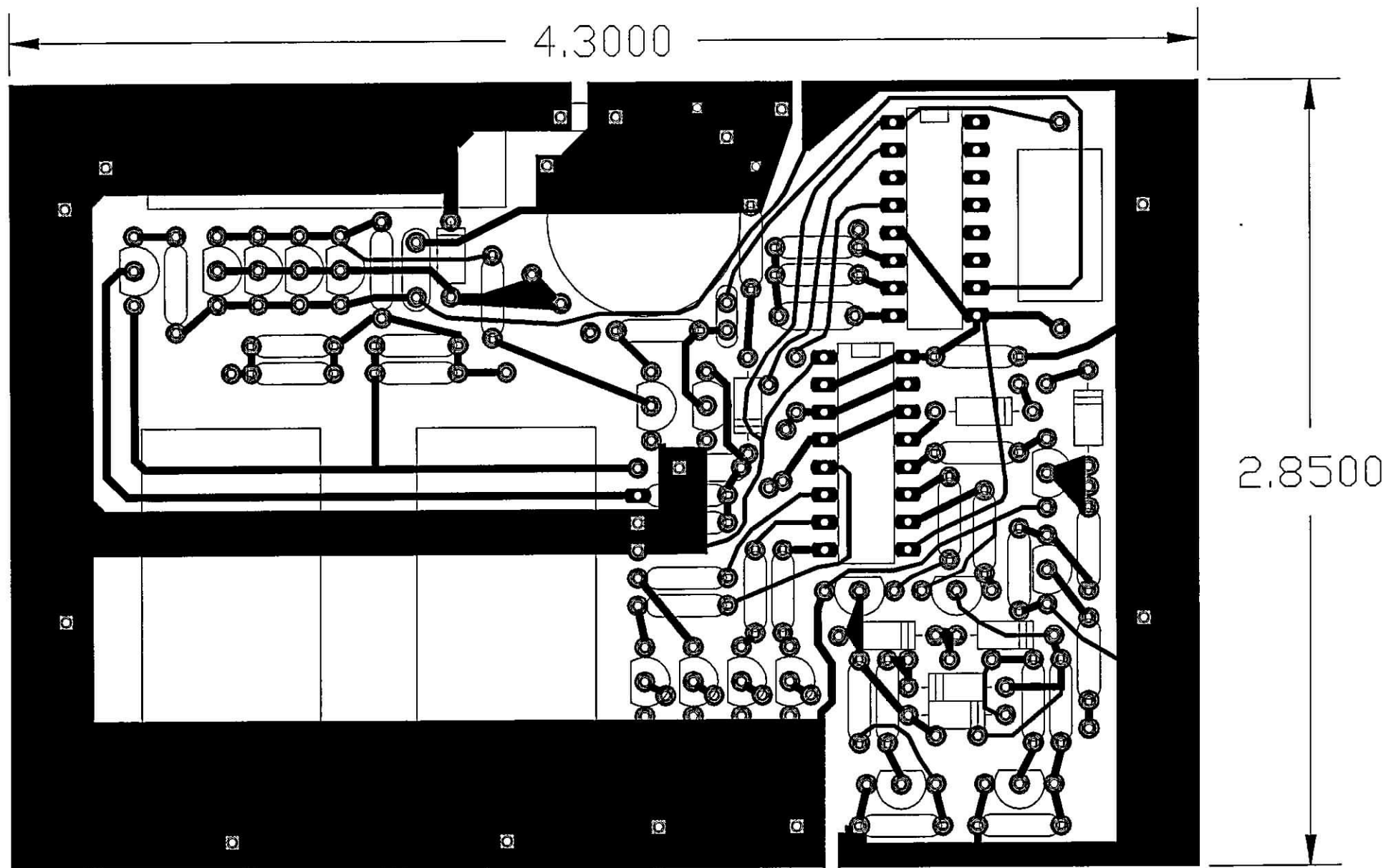


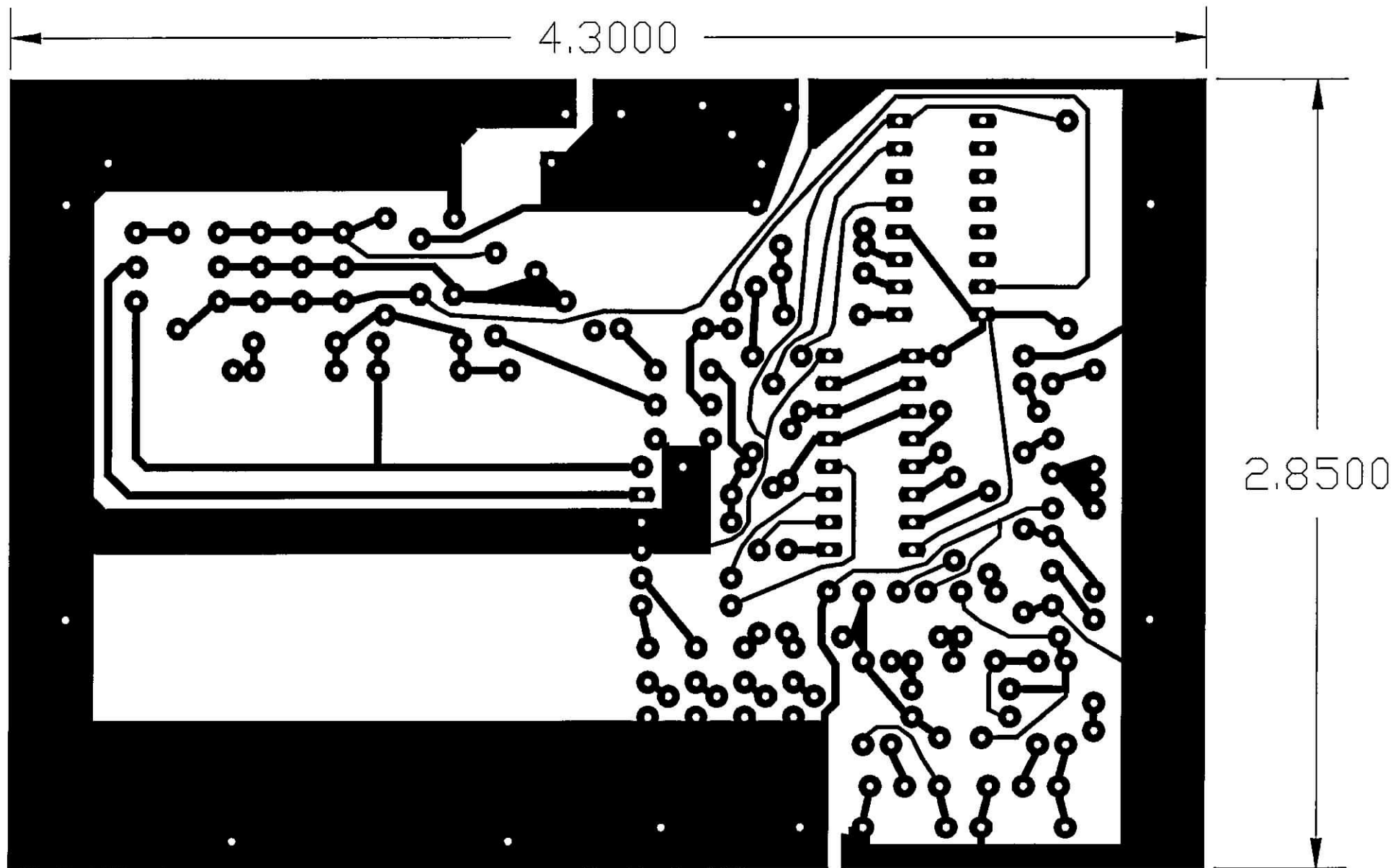


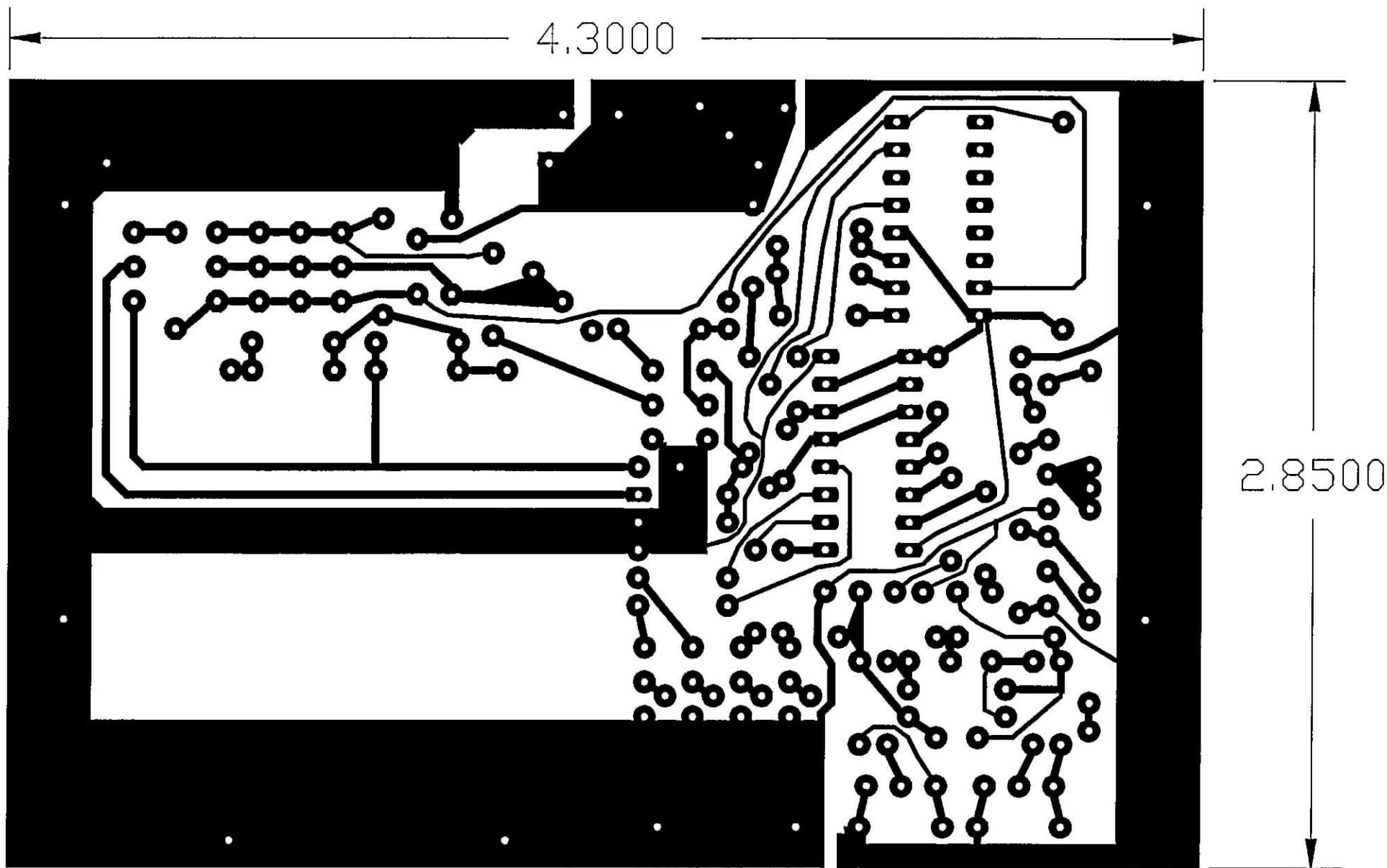
Q = MPS.
A64

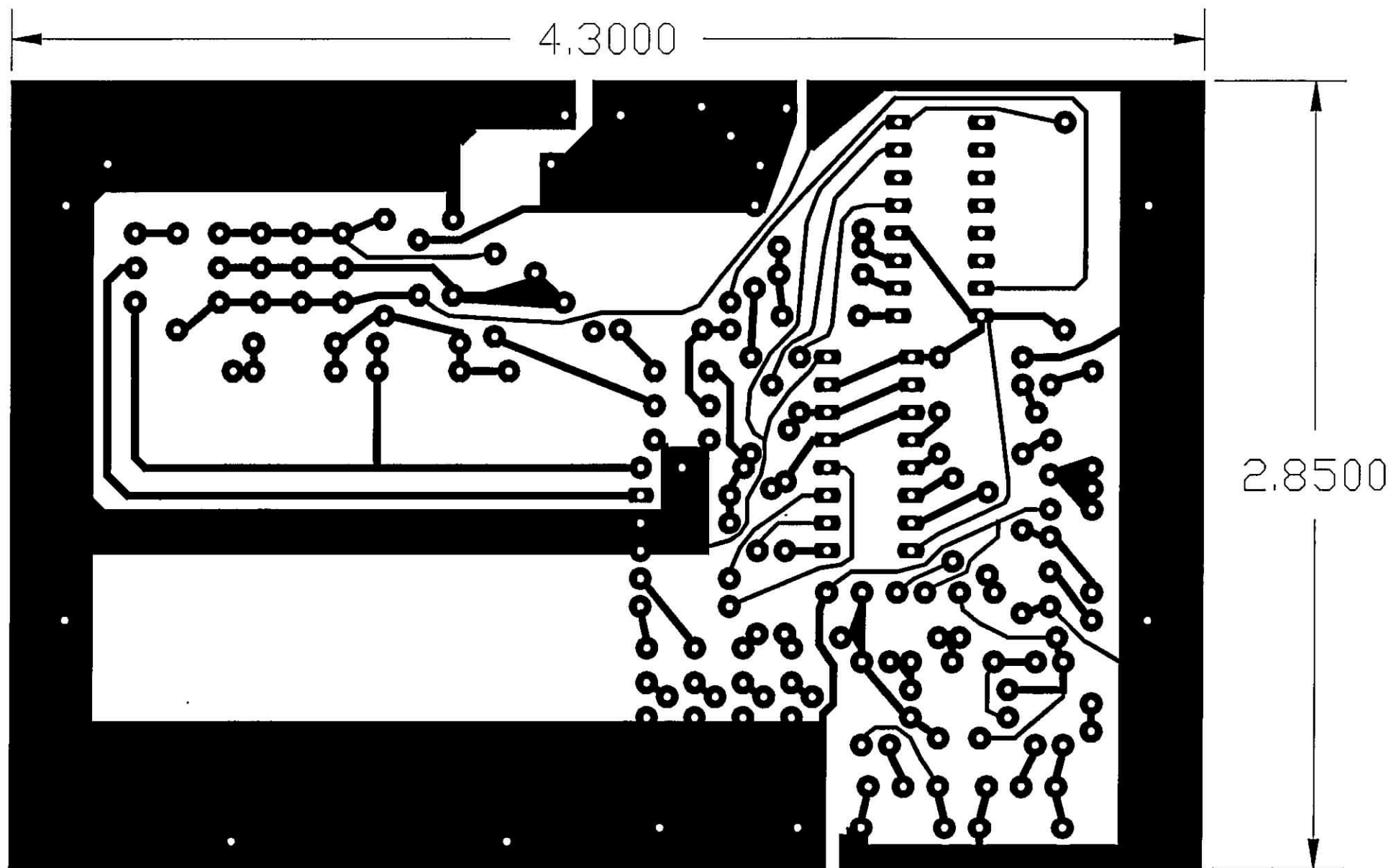




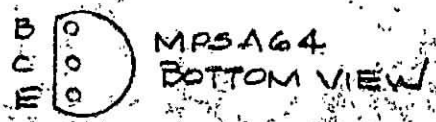
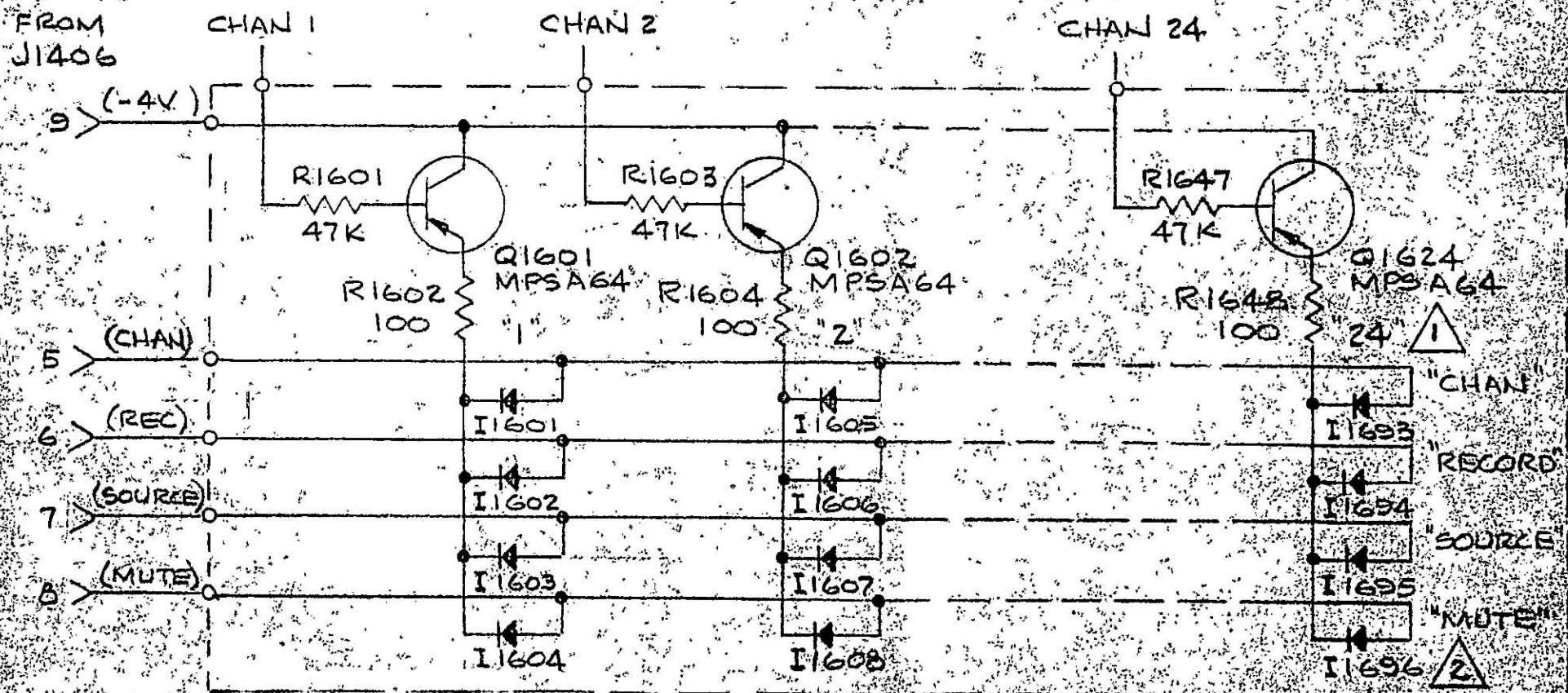








REVISIONS			
LTR	DESCRIPTION	DATE	BY



2 LED CARD UNIT SERIES CONTINUES INTO 1700'S FOR 32 & 40 TRACK.

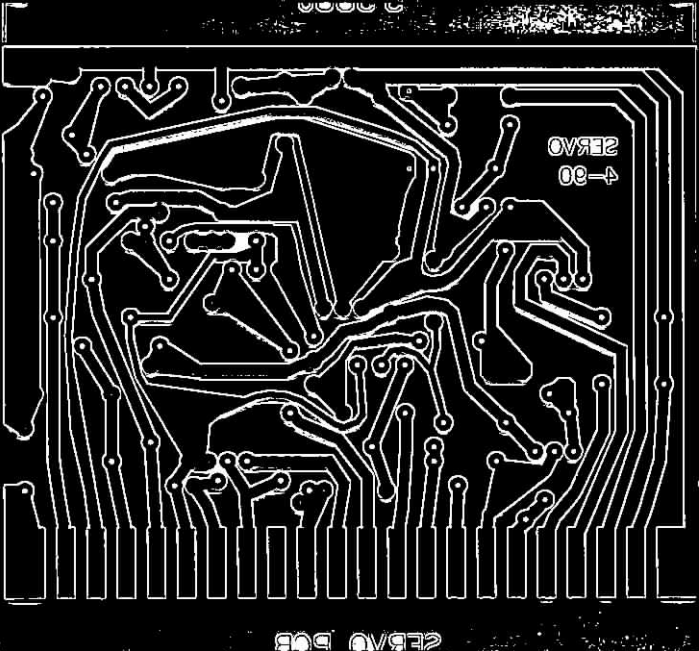
1 24 TRK VERSION SHOWN. LAST NO. CORRESPONDS TO NO. OF TRACKS

STEPHENS ELECTRONICS, INC.

SCALE	APPROVED BY	DRAWN BY
DATE 22 OCT 75		REVIEWED
LED CARD		
MODEL 821-B	FIGURE 6-14	DRAWING NUMBER
		SC1601

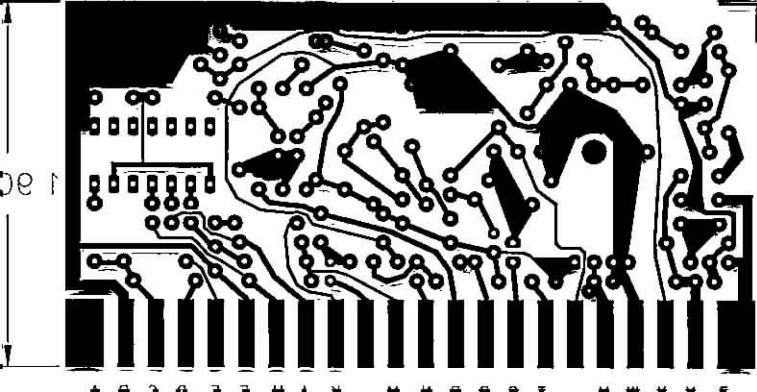
SERVO
4-90

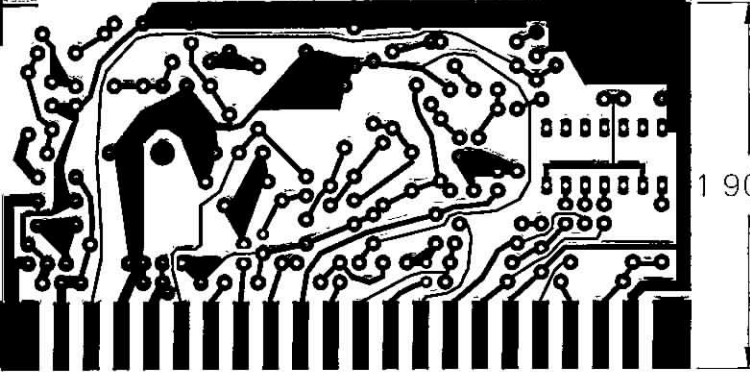




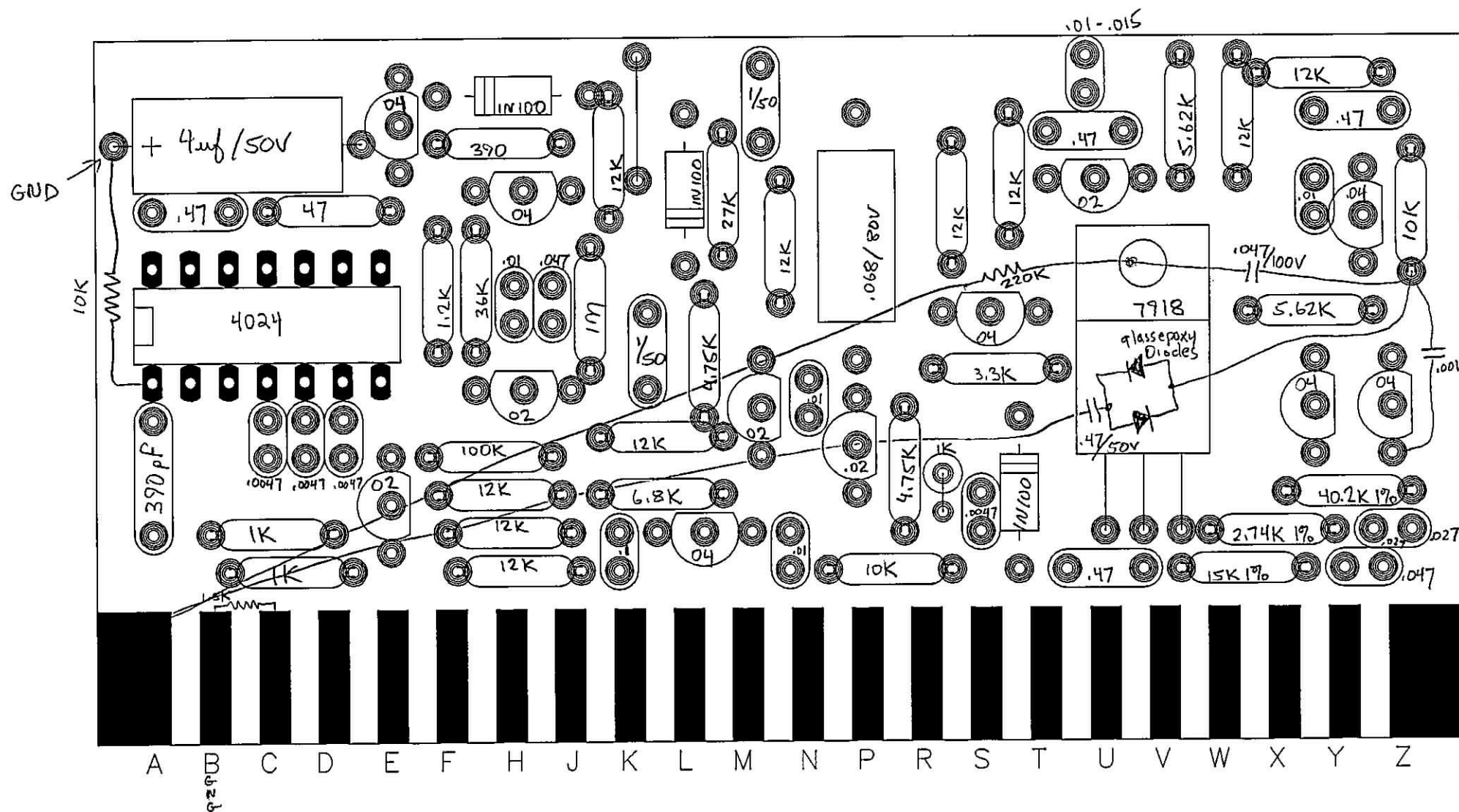
SERVO
4-80

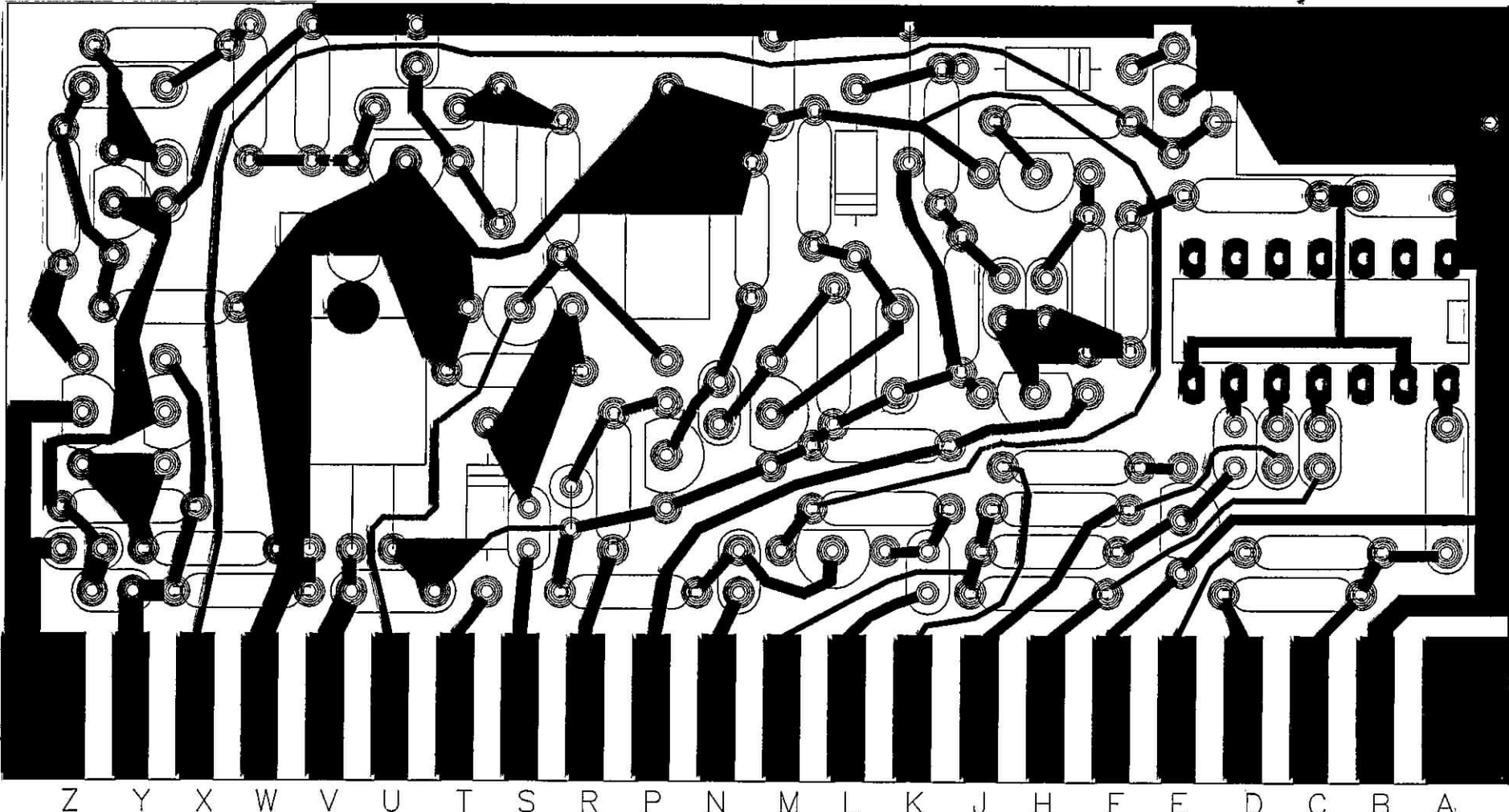
SERVO BOB

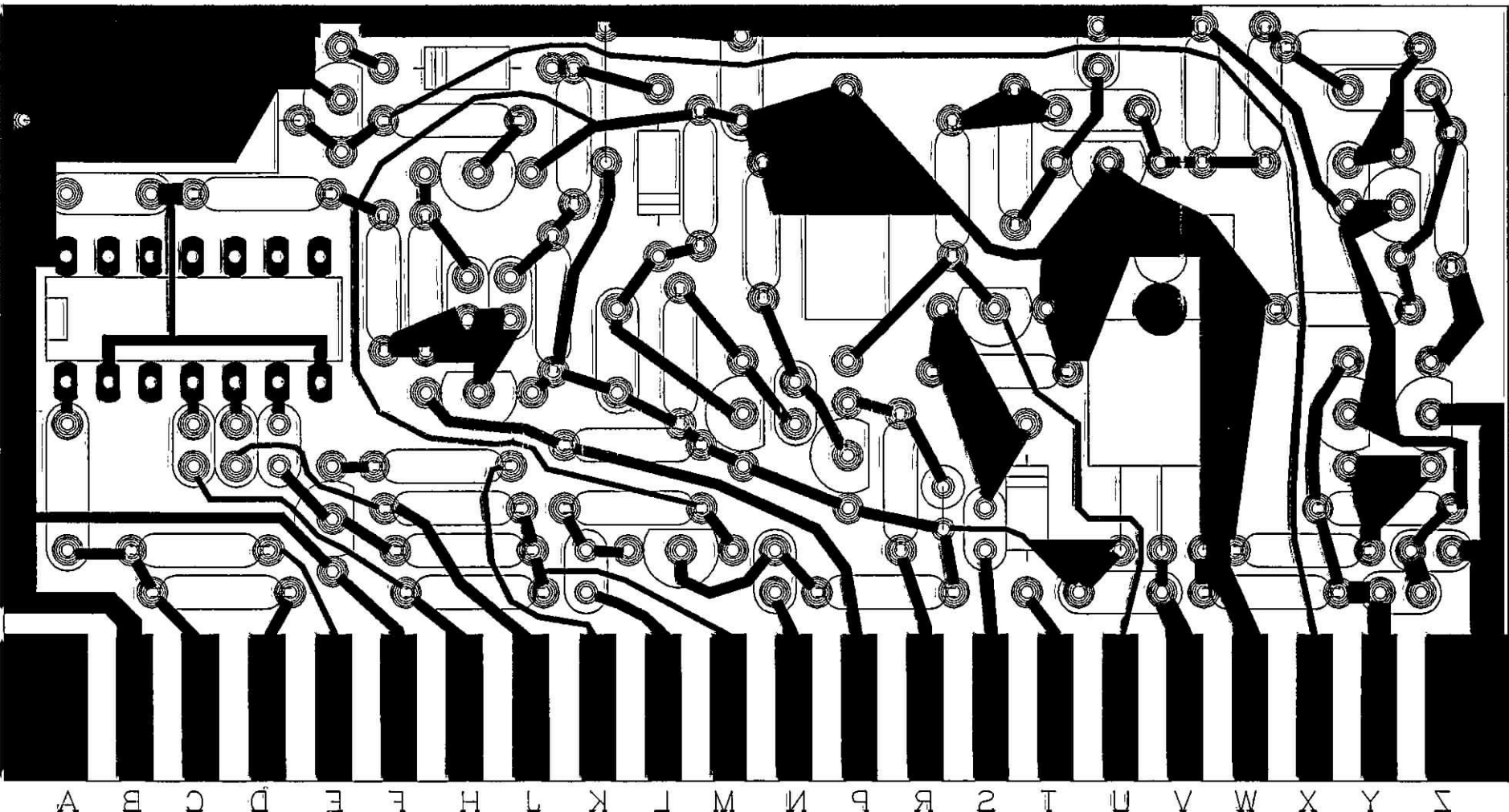


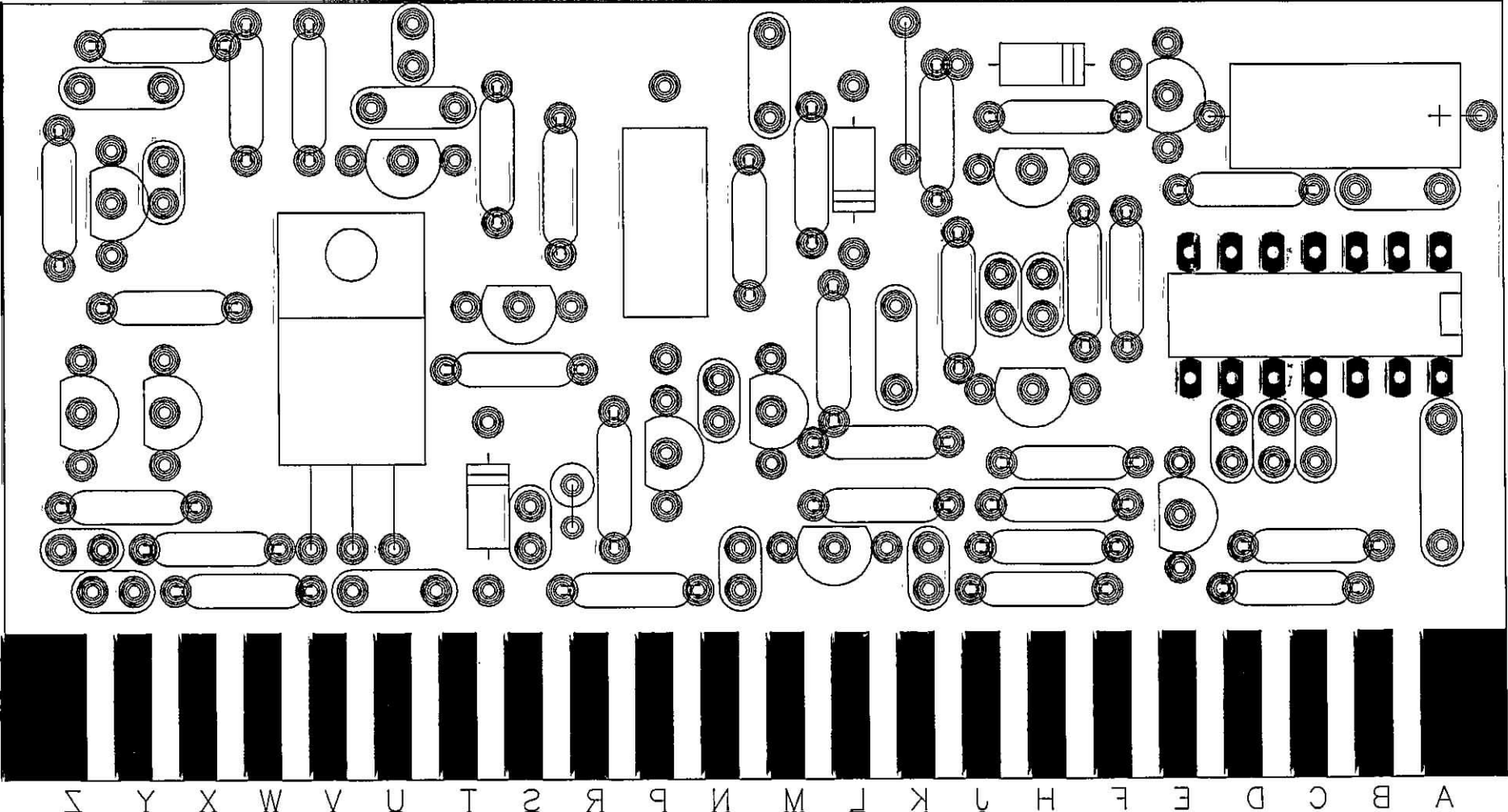


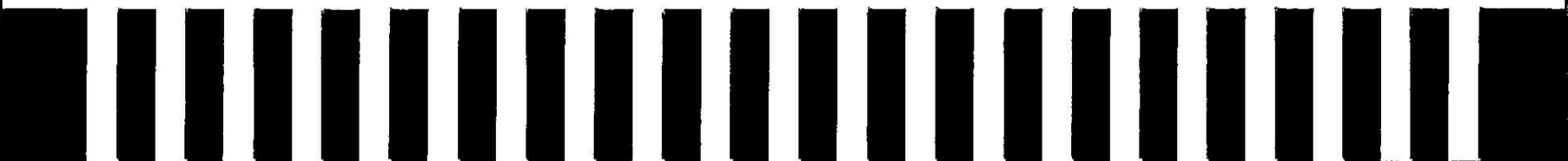
CONVERTER





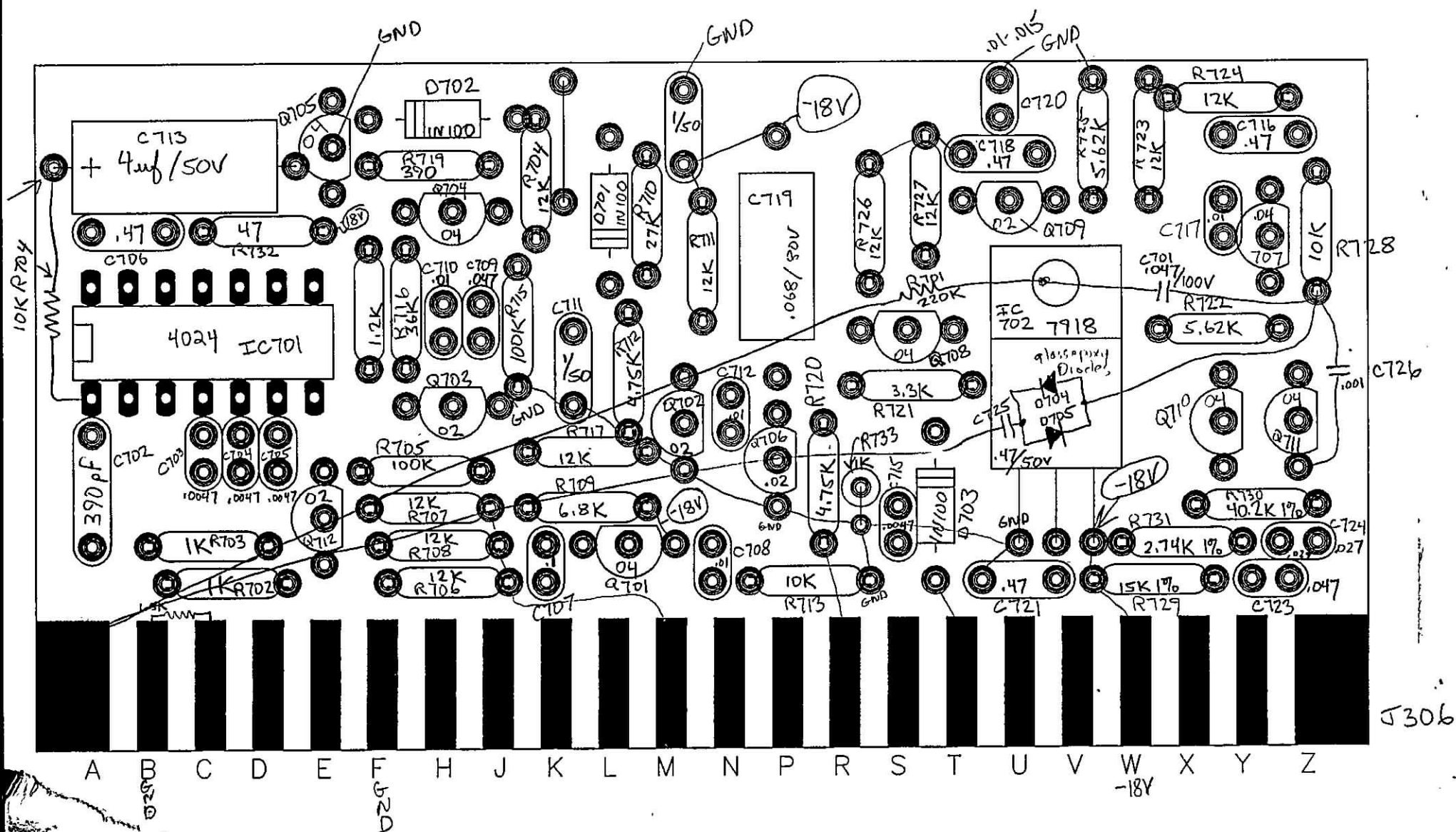


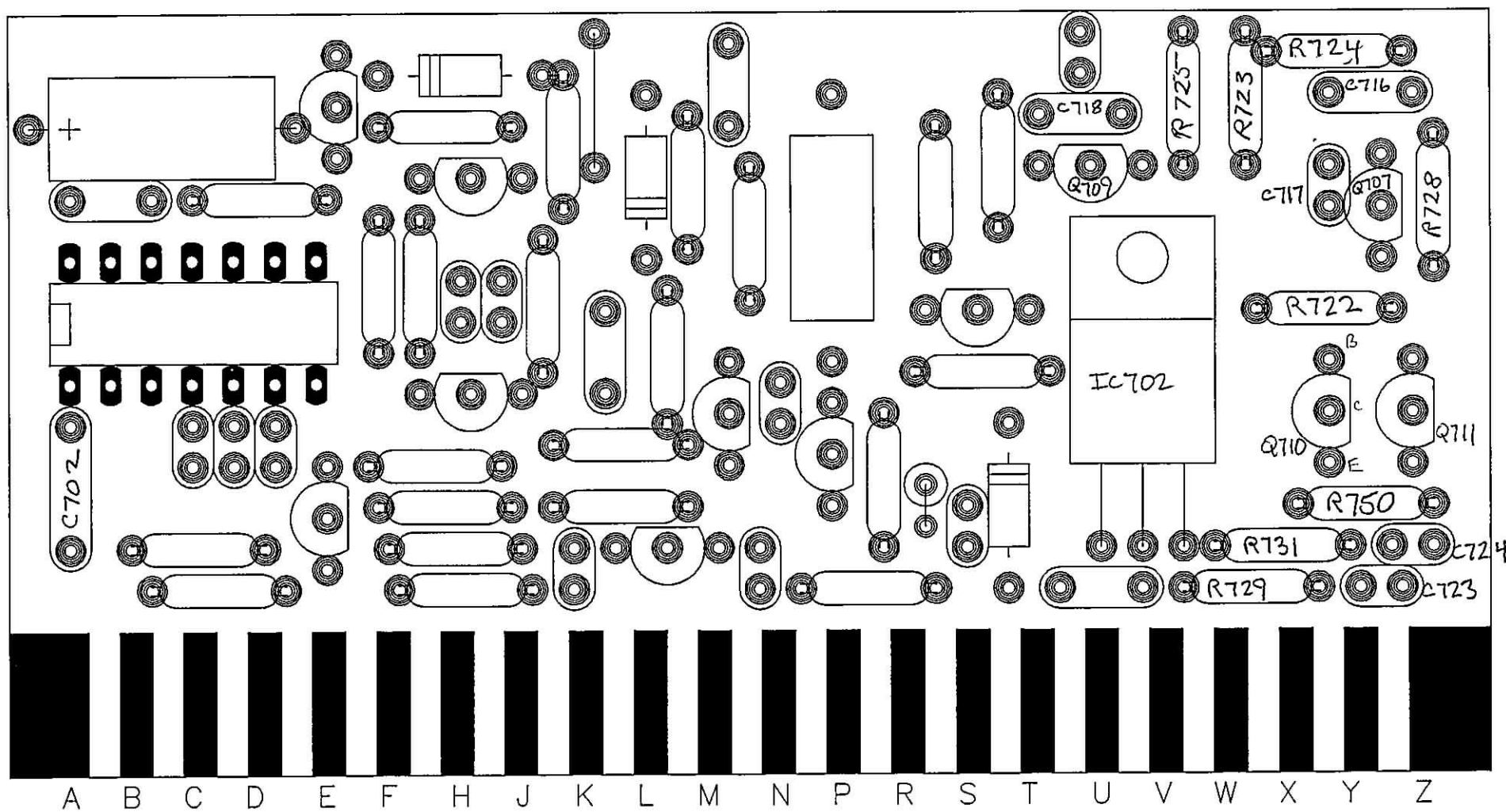


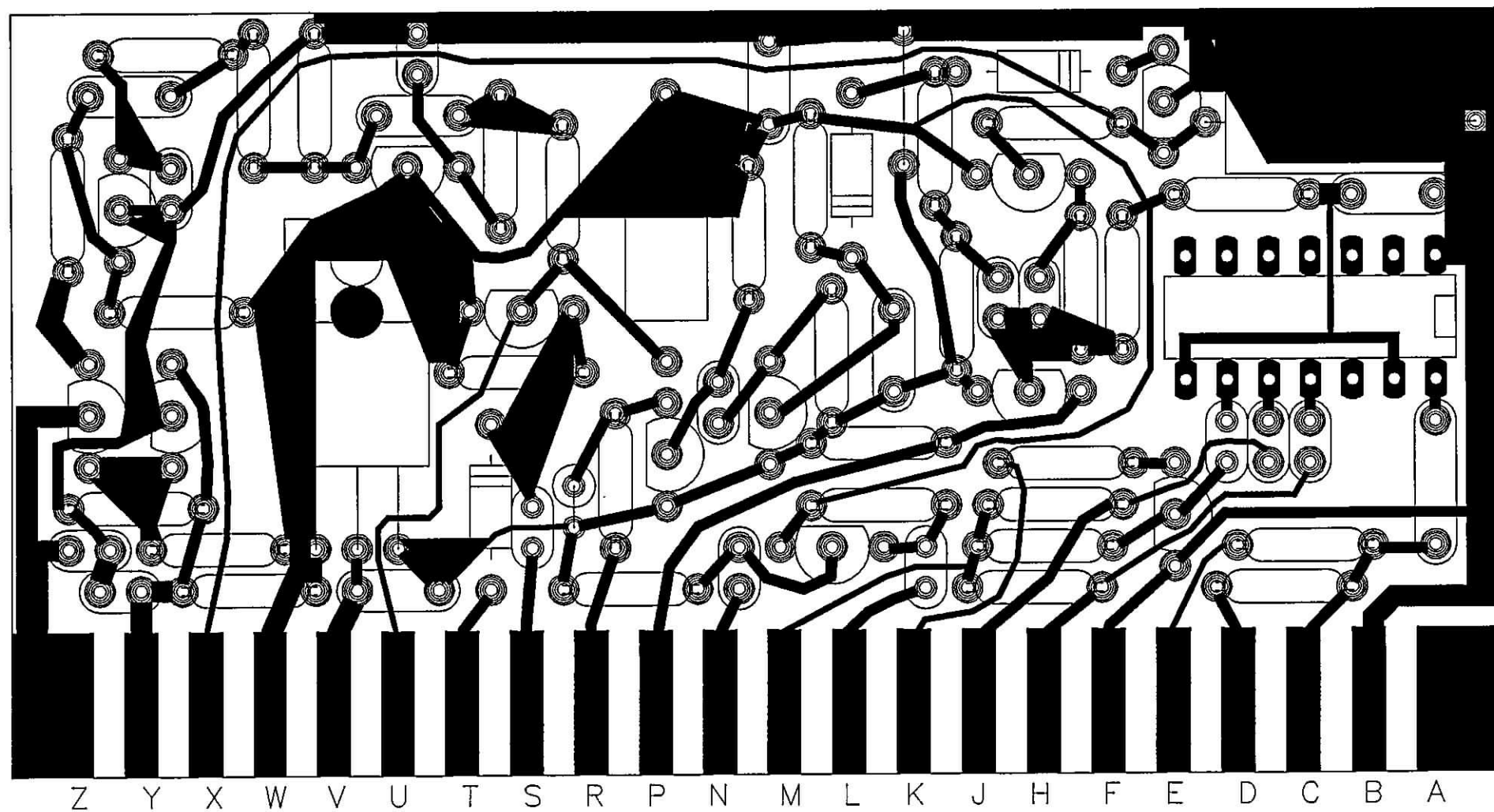


A B C D E F F H J K L M N P R S T U V W X Y Z

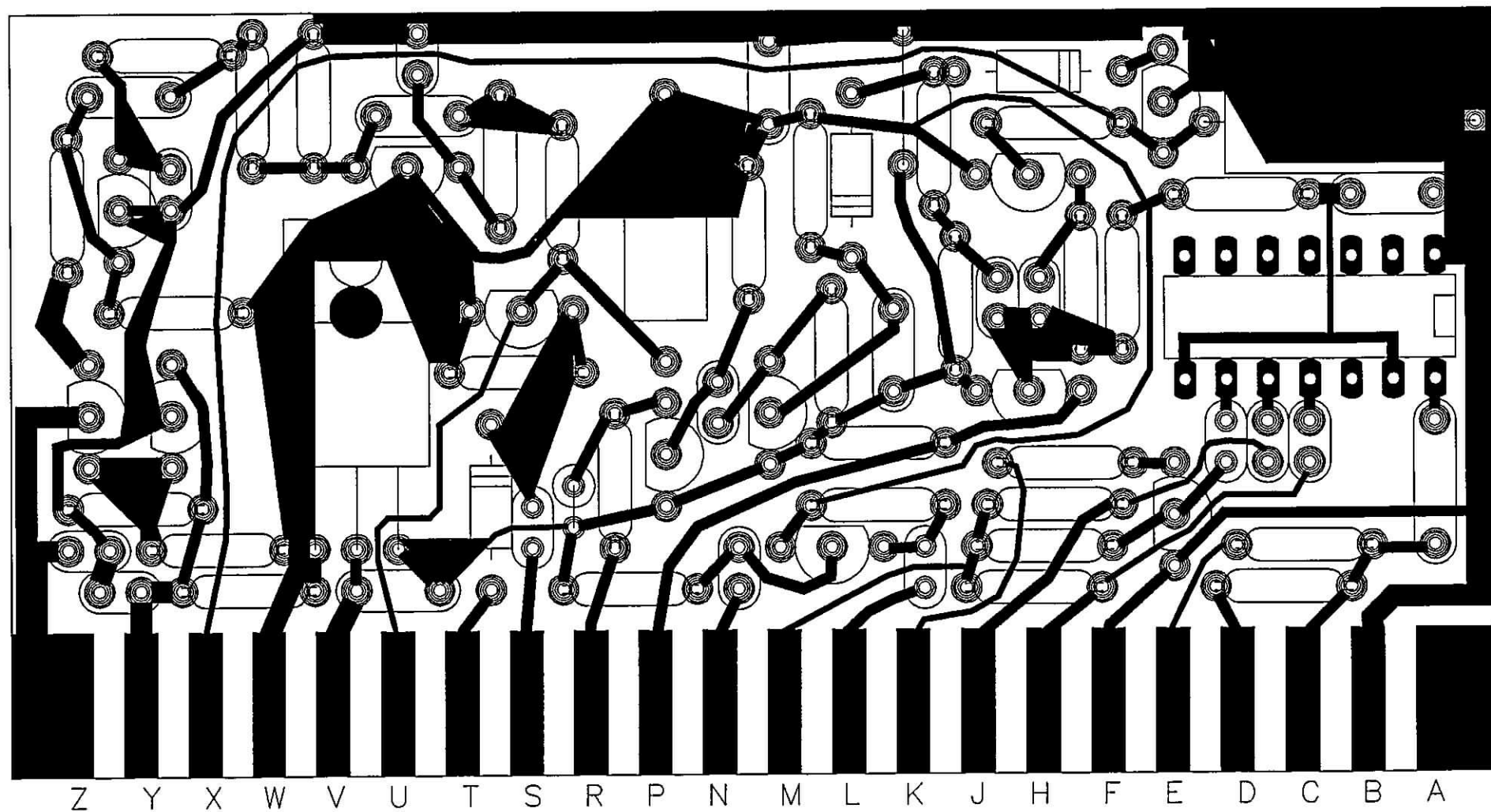
CONVERTER

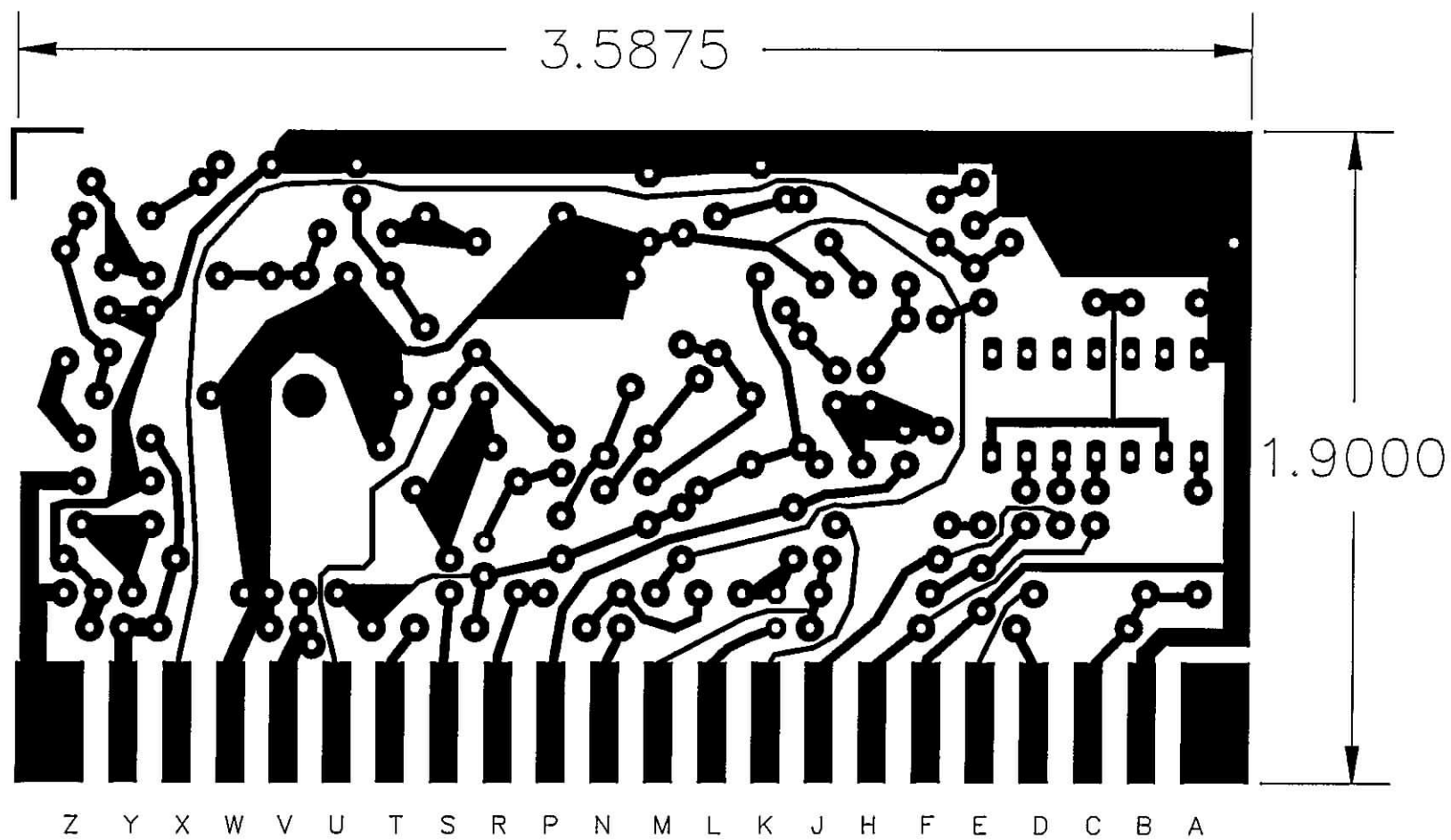




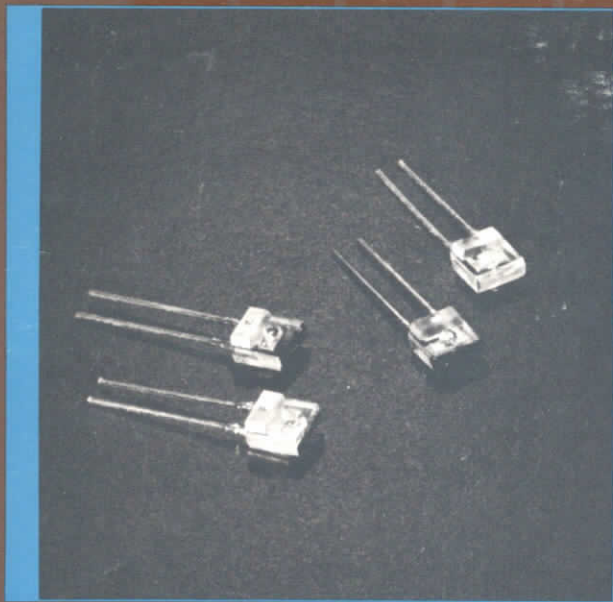


STEPHENS 812B
CONVERTER PCB
FILE: ST_CONV
4-1-90





Matched Emitter/Detector Pair STED 3000



Description

The STED 3000 is an optically and mechanically matched pair consisting of a gallium arsenide, infrared LED and an NPN silicon, planar photo-transistor. The individual component packages are color coded for easy identification. Red designates the phototransistor, and black the LED.

Features

- Side looker package
- Optically and mechanically matched
- Durable, low cost plastic housing

Applications

- Optical interrupters
- Acceleration, location sensing
- Low cost object detection

*Coupled Characteristics

Output Current, I_L @ $I_F = 30$ mA, $V_{CE} = 5$ V	1.5 mA Min.
Saturation Voltage, $V_{CE(Sat)}$ @ $I_F =$ 30 mA, $I_C = 1.8$ mA	0.4 V Max.

Switching Speeds

Rise Time t_r @ $V_{CC} = 5$ V, $I_F = 30$ mA, $R_L = 2.5k\Omega$	10 μ sec TYP
Fall Time t_f @ $V_{CC} = 5$ V, $I_F = 20$ mA, $R_L = 2.5k\Omega$	15 μ sec TYP

Electrical and Optical Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Emitter-Detector Pair

Operating Temperature, T_{opr}	-20° to $+100^\circ\text{C}$
Storage Temperature, T_{stg}	-30° to $+100^\circ\text{C}$

LED

Power Dissipation, P_D	100 mW
Forward Current, I_F	60 mA
Reverse Voltage, V_R	5 V

Phototransistor

Power Dissipation, P_D	100 mW
Collector Current, I_C	40 mA
Collector-Emitter Voltage, V_{CE}	30 V
Emitter-Collector Voltage, V_{CE}	5 V

Individual Electro-Optical Characteristics

LED

Forward Voltage, V_F @ $I_F = 60$ mA	1.6 V Max.
Reverse Breakdown Voltage, V_R @ $I_R = 10$ μ A	5 V Max.

Sensor

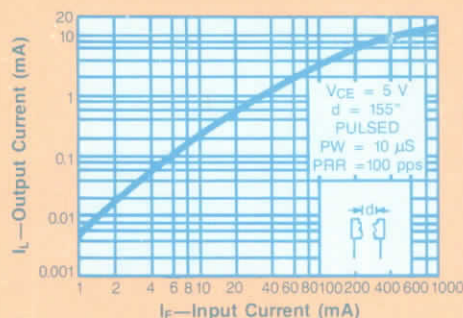
Dark Current, I_D @ $V_{CE} = 10$ V	100 nA Max.
Collector-Emitter Breakdown Voltage, BV_{CE} @ $I_C = 100$ μ A	30 V Min.
Emitter-Collector Breakdown Voltage, BV_{EC} @ $I_E = 100$ μ A	5 V Min.

NOTE:

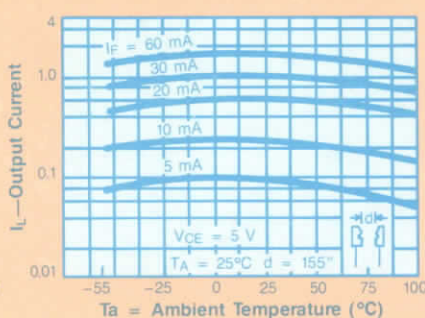
*Coupled characteristics are measured at a separation distance of 0.1555 in. with lenses of emitter and detector on a common axis within .004" and parallel within 5° . No stray irradiation is allowed.

STED 3000 Typical Characteristics

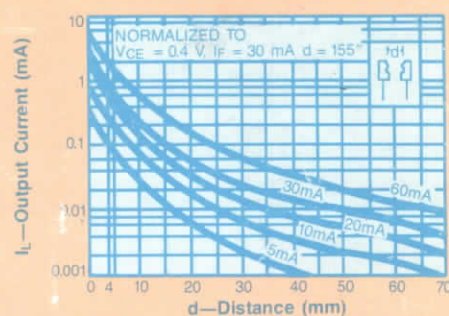
Output Current vs. Input Current



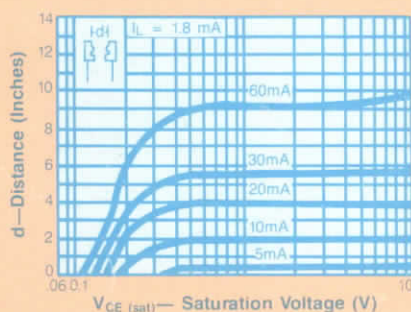
Output Current vs. Temperature



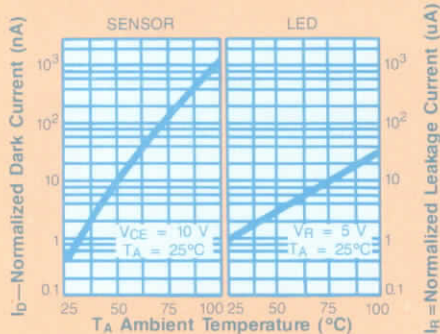
Output Current vs. Distance



VCE (sat) vs. Distance



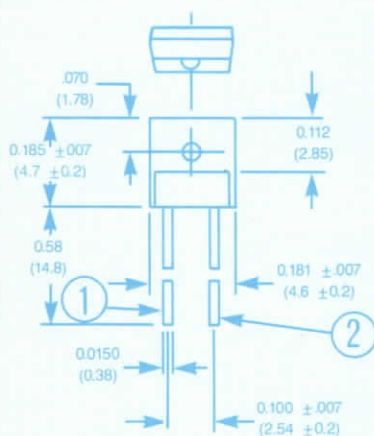
Leakage Currents vs. Temperature



Switching Speed vs. Load Resistance



Mechanical Data



NOTE: Unit in inches and () in mm. Tol ± 0.005 (± 0.13)

SCHEMATIC



PIN	LED	SENSOR
①	CATHODE	EMITTER
②	ANODE	COLLECTOR

Sensor Technology is a leading producer of optoelectronic components, encoders and a wide variety of semi-custom optoelectronic assemblies. Sensor Technology's in-depth electronic and

electromechanical engineering support staff helps customers take their products from prototype development through high-volume production.

Sensor Technology has developed a nationwide network of experienced manufacturer's representatives — each attuned to understanding your application and selecting the Sensor Technology device that will best do the job for you. Contact our factory for the representative nearest you.

**SENSOR
TECHNOLOGY**

A Division of ILC Technology

12832 Chadron Ave./Hawthorne, CA 90250/(213) 978-1150

FAX: 213-978-1230 TWX: 910-494-4776

MT

CONNECTOR - JC - 50 pin

1-20-71
1-15-77

CABLE COLOR JC
TO REMOTE

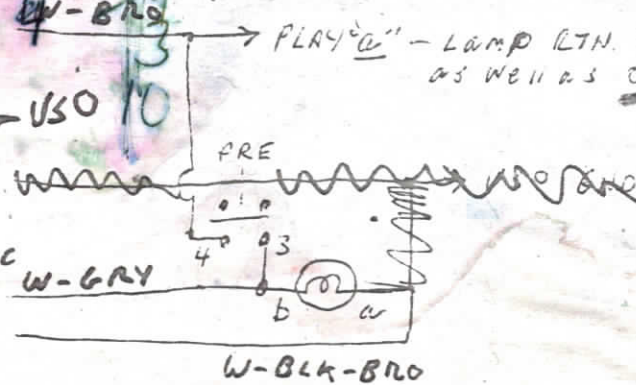
5207

48/C CABLE
#24-7/32 TC .009 S.R. PVC
80°C 300V AWM
.063 PVC JACKET

RW a	BRO	1
L a	RED	2
P b	ORG	3
ST 2	YEL	4
ST a	GRN	5
ST 1	BLU	6
LT	VID	7
RW 2	GRY	8
F a	WHT	9
RC a	BLK	10

NOTE! G II LIGHTS RETURN TO -27 VOLTS

TV. PW	WHT-BRO	11
TV. V50	WHT-RD	12
50 SW. RM.	WHT-ORG	13
50 JET. 12V. 30W	WHT-YEL	14
6ND	WHT-GRN	15
ND SP. 12V. 30W	WHT-BLU	16
T SP. 12V	WHT-VID	17 NC
LT 243	WHT-GRY	18
10	WHT-BLK-BRO	19
ON OUT	WHT-BLK	20
RMP ON	WHT-RD-BRO	21 NC
MP 1H	WHT-BLK-RD	22
P.S.	WHT-RD-ORG	23
MP IN	WHT-RD-YEL	24
DISP ST. 43	WHT-RD-GRN	25 — DISPLAY STICK
SPEED SW.	WHT-RD-BLU	26 NC
DISP STICK 1	WHT-RD-VID	27 — DISPLAY STICK
Fig. 3, 1-16-63	WHT-RD-GRY	28
7	WHT-BLK-BRN	29
80	WHT-ORG-BLK	30
15	WHT-ORG-BRN	31
STORE	WHT-BLK-BLU	32
STORE	WHT-BLK-VID	33
Fig. 5, 1-16-63	WHT-ORG-YEL	34
ANT	WHT-ORG-GRN	35
play stick	A7 WHT-ORG-BLU	36
	A8 WHT-ORG-VID	37
	B8 WHT-ORG-GRY	38
	B7 WHT-BLK-GRY	39
	B2 WHT-BLK-YEL	40
	B3 WHT-BRO-YEL	41
	A2 WHT-BRO-GRN	42
	B1 WHT-BRO-BLU	43
3 FT. 5.	WHT-BRO-VID	44
Fig. 5.	WHT-YEL-GRN	45
Fig. 5, 1-16-63	WHT-YEL-BLU	46
start	WHT-YEL-VID	47
MB	WHT-BRO-GRY	48



IF 50 COND. CABLE - CLIP SHORT
THE FOLLOWING

WHT-BLU-GRY
WHT-BLU-BRN
WHT-BLU-VID
WHT-GRN-VID
WHT-GRN-GRY
WHT-GRY-YEL
WHT-GRY-VID
WHT-BLK-BRO-ORG
WHT-BLK-BRO-YEL
WHT-BLK-BRO-BLU
WHT-BLK-BRO-RD
WHT-BLK-BRO-GRN

Pins

17 - NC
20 + 22 tie together
21 - NC
23 + 24 tie together
26 - NC

DISPLAY
STICK

BOTTOM OF DISPLAY STICK

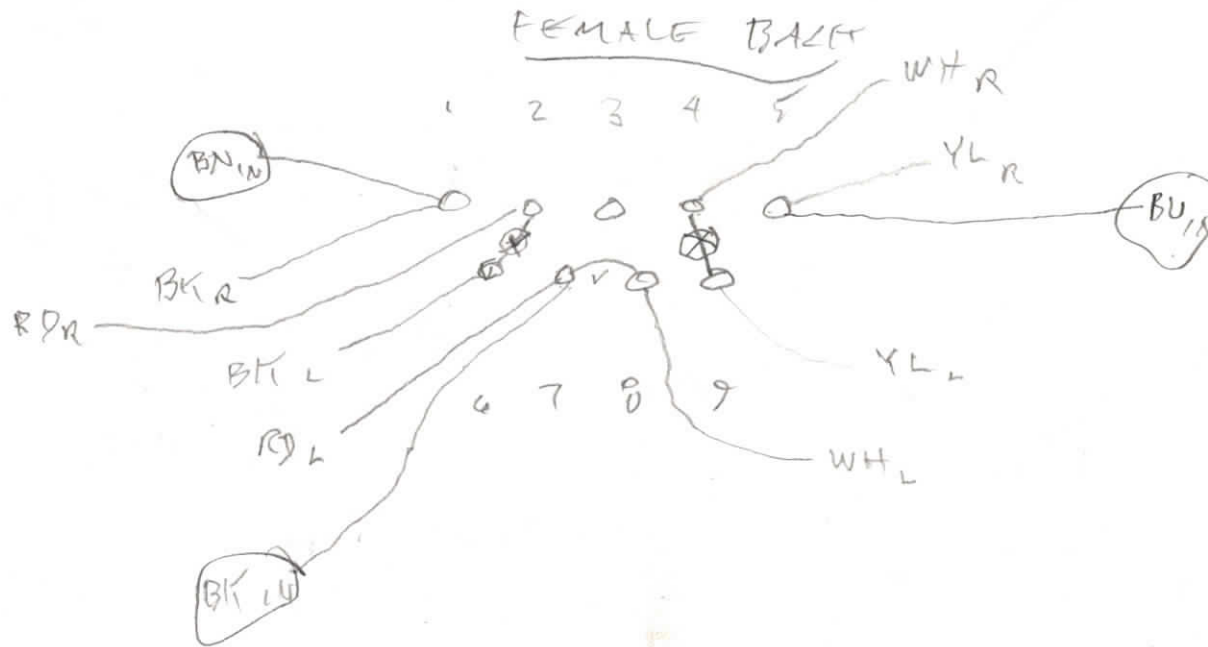
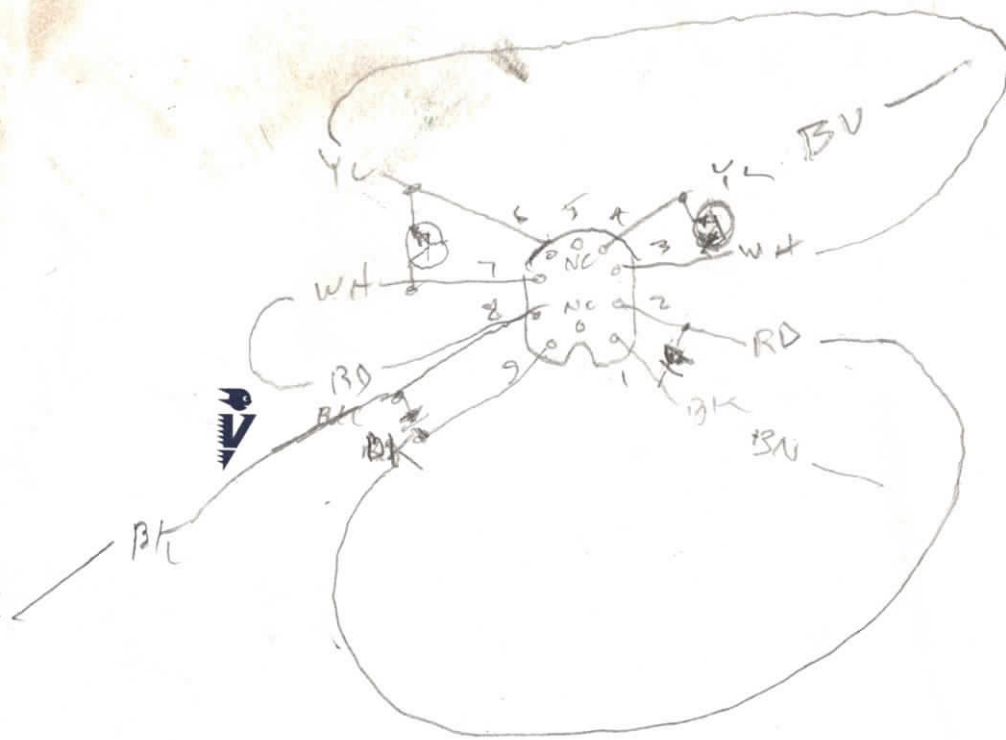
WHT-BLK-BRO-NC 50 COND
WHT-BLK-BRO-NC 50 COND

0611

1	—	4
2	—	5
3	—	5
4	—	11
5	—	2
6	—	1
7	—	8
8	—	7
9	—	9
10	—	3
11	—	10





VRROOM



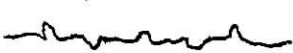
TKS 3 & 4 NO RCD —
TK 14

TKS 21, 22, 23, 24 NO ERASE OR RCD.


C — SENSOR DIRECT 

D —  STROBE


E —  STROBE

M —  STROBE

P —  STROBE

R —  OSC.

S —  STROBE 14 f

X —  60 Hz (?) STROBE

Y — 17 VDC

X — 3.77 VDC

W — 26 VDC

V — 26 VDC

U — 24 VDC

T — 22 VDC

R — 5.25 VDC

C — 21 VDC

A — 2.25 VDC

L 2

D 2

VRROOM



NOV 22/12/9 2/3/4/6/21/22

1/3 No P/B - NO SPAC

3 4 5 6 7 8 9 10 11 12 13

3.9, 5, 22 NO RCD

PB #1 & #7 DEAD 4 -

NEED RELAYS

TEST TAPE FULL TRACK

Good DEGAUSSER

NEED - Ampenol Pin Extractor + Crimper

Pre Amp Diodes

1 N 100.

Greenwich Diode

Not Silicone Different Voltage

Across The Junctions -

6 1/2 hr.

TK. 14 - NO BIAS ADJ.

TK. 22 - DEAD

TK. 24 - NO BIAS ADJ.



Stephens 821A-24 Electronics

Sync Panel Input-Output Connector

(Amphenol 57-40500 Chassis)
(Amphenol 57-30500 Cable)

CONNECTOR 1

<u>Pin</u>	<u>Connection</u>
1-12	Playback-Out Hot (1=Channel 1)
13-24	Record In Hot (13=Channel 1)
26-37	Dolby Controls (26=Channel 1)
38	Record Signal
39-50	Grounds

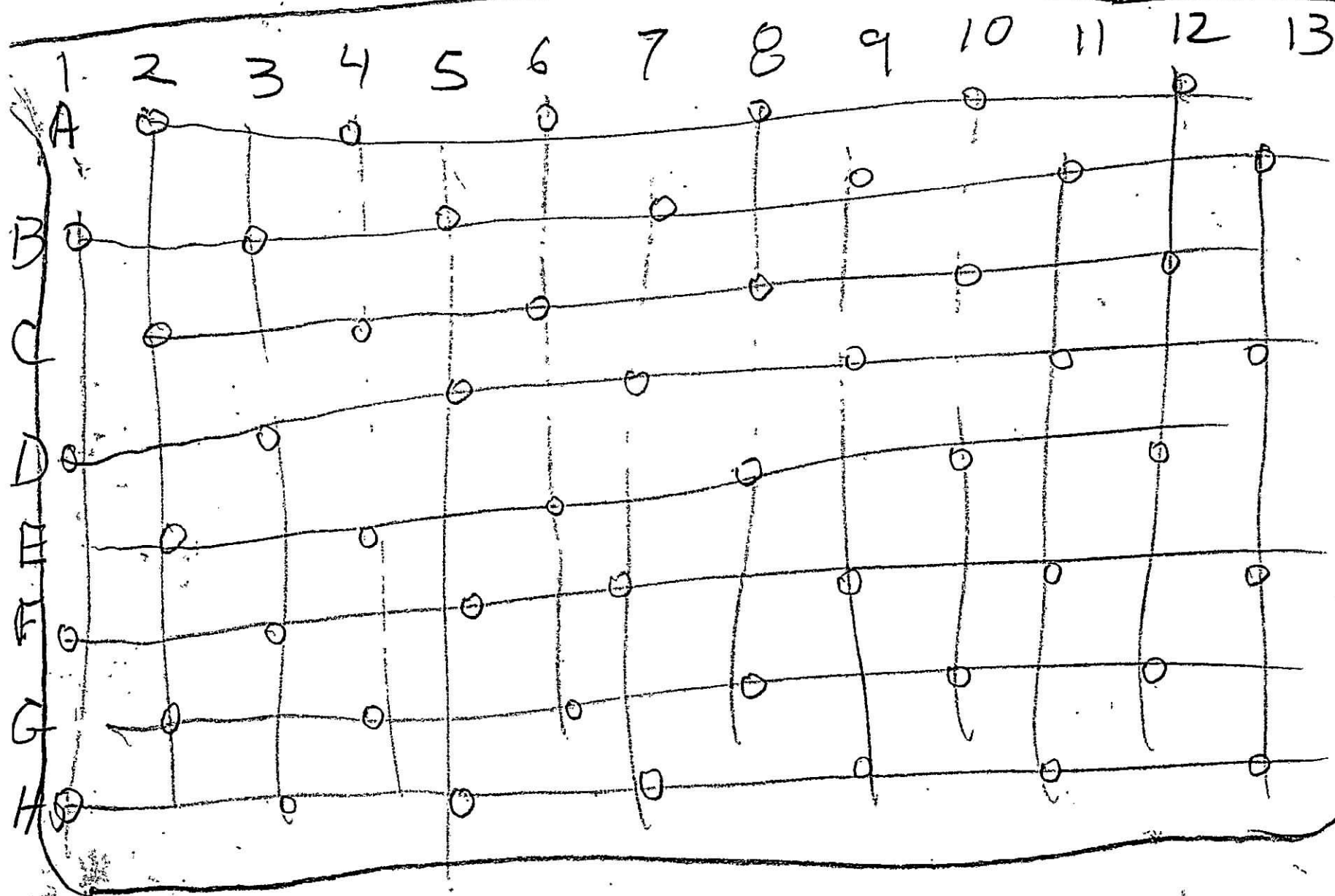
CONNECTOR 2

<u>Pin</u>	<u>Connection</u>
1-12	Playback-Out Hot (1=Channel 13)
13-24	Record In Hot (13=Channel 13)
26-37	Dolby Controls (26=Channel 13)
38	Record Signal
39-50	Grounds

Rear View

STEPHENS

SU - Connectors



	310163	310164	SW S.J.I.	J.R. Aug.	T.S.I.		
Brown 1			B 3			57-40350	32"
d 2			D 3			J.C.	36"
ange 3			F 3				32
ellow 4			H 3				32
reen 5			A 4				32
ue 6			C 4				32
ue 7			E 4				32
een 8			G 4				32
hite 9			B 5				32
ack 10			D 5				32
Brown 11			F 5				32
Red 12			A 6				32
Orange 13			C 6				32
Yellow 14			E 6				32
Green 15			G 6				32
Blue 16			D 7				32
Violet 18		W					24"
Violet 19		W					
Black 20	L			grad.			26"
Brown 21					10		27"
Red 22		Y					27"
ange 23		X					27"
Black 24	U			grad.			25"
Violet 25		E					24
Black 26				grad.			27
Brown 27		M					26
ed 28		N					26
ange 29		P					27
e 30							

CONNECTION - JC - 50 PM

11-16-77

CABLE CABLE
TO REMOTE JC

BRD	1
RED	2
ORA	3
YEL	4
GRN	5
BLU	6
VIO	7
GRY	8
WHI	9
BLK	10
WHI-BRD	11
WHI-RED	12
WHI-ORA	13
WHI-YEL	14
WHI-GRN	15
WHI-BLU	16
WHI-VIO	17
WHI-GRY	18
WHI-BLK-BRD	19
WHI-BLK	20
WHI-RED-BRD	21
WHI-BLK-RED	22
WHI-RED-ORA	23
WHI-RED-YEL	24
WHI-RED-GRN	25
WHI-RED-BLU	26
WHI-RED-VIO	27
WHI-RED-GRY	28
WHI-BLK-GRN	29
WHI-ORA-BLK	30
WHI-ORA-GRN	31
WHI-BLK-BLU	32
WHI-BLK-VIO	33
WHI-ORA-YEL	34
WHI-ORA-GRN	35
WHI-ORA-BLU	36
WHI-ORA-VIO	37
WHI-ORA-GRY	38
WHI-BLK-GRY	39
WHI-BLK-YEL	40
WHI-BRD-YEL	41
WHI-BRD-GRN	42
WHI-BRD-BLU	43
WHI-BRD-VIO	44
WHI-YEL-GRN	45
WHI-YEL-BLU	46
WHI-YEL-VIO	47
WHI-BRD-GRY	48
	49
	50

RSC code for
one-way snake

1	BRN/WHT
2	RED/WHT
3	ORA/WHT
4	YEL/WHT
5	GRN/WHT
6	BLU/WHT
7	VIO/WHT
8	GRY/WHT
9	BRN/BLK
10	RED/BLK
11	ORA/BLK
12	YEL/BLK
13	GRN/BLK
14	BLU/BLK
15	VIO/BLK
16	WHT/BLK

RSC code for
2-way snake

1	BRN/WHT	(Output)
2	RED/WHT	(Output)
3	ORA/WHT	(Output)
4	YEL/WHT	(Output)
5	GRN/WHT	(Output)
6	BLU/WHT	(Output)
7	VIO/WHT	(Output)
8	GRY/WHT	(Output)
9	BRN/BLK	(Input)
10	RED/BLK	(Input)
11	ORA/BLK	(Input)
12	YEL/BLK	(Input)
13	GRN/BLK	(Input)
14	BLU/BLK	(Input)
15	VIO/BLK	(Input)
16	WHT/BLK	(Input)

THE Following
is

821A MATERIAL

1871A-TAPE SYSTEM MULTI-CONN. BRK

5 of 6

SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ17	SJ18	CKT.
		E 4				A 15		SS 9
		E 6				C 15		SS 10
		E 8				E 15		SS 11
		E 10				G 15		SS 12
			E 4			B 16		SS 13
			E 6			D 16		SS 14
			E 8			F 16		SS 15
			E 10			H 16		SS 16
				E 4		A 17		SS 17
				E 6		C 17		SS 18
				E 8		E 17		SS 19
				E 10		G 17		SS 20
					E 4		A 13	SS 21
					E 6		C 13	SS 22
					E 8		E 13	SS 23
					E 10		G 13	SS 24
D 5						A 19		RR 1
C 6						C 19		RR 2
D 7						E 19		RR 3
C 8						G 19		RR 4
	D 5					B 20		RR 5
	C 6					D 20		RR 6
	D 7					F 20		RR 7
	C 8					H 20		RR 8
		D 5				A 21		RR 9
		C 6				C 21		RR 10
		D 7				E 21		RR 11
		C 8				G 21		RR 12
			D 5			B 22		RR 13
			C 6			D 22		RR 14
			D 7			F 22		RR 15
			C 8			H 22		RR 16
				D 5		A 23		RR 17
				C 6		C 23		RR 18
				D 7		E 23		RR 19
				C 8		G 23		RR 20
					D 5		A 19	RR 21
					C 6		C 19	RR 22
					D 7		E 19	RR 23
					C 8		G 19	RR 24
F 1	F 1	F 1	F 1	F 1	F 1	B 6	B 6	GND.
F 3	F 3	F 3	F 3	F 3	F 3	D 6	D 6	GND.
F 5	F 5	F 5	F 5	F 5	F 5	F 6	F 6	GND.
F 7	F 7	F 7	F 7	F 7	F 7	H 6	H 6	GND.
F 9	F 9	F 9	F 9	F 9	F 9	B 12	B 12	GND.
F 11	F 11	F 11	F 11	F 11	F 11	D 12	D 12	GND.
F 12	F 12	F 12	F 12	F 12	F 12	F 12	F 12	GND.
						H 12	H 12	GND.
						B 18	B 18	GND.
						D 18	D 18	GND.
						F 18	F 18	GND.
						H 18	H 18	GND.

SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ7	J.D.	SJ17	SJ18	CKT.	WIRE
B7						B 13				BIAS	SHIELD
	R7					D 13				BIAS	" "
		B7	B7			F 13				BIAS	" "
G8				B7	B7	H 13				BIAS	" "
	E8					B 9				-39V	ORG
		G8	G8			D 9				-39V	" "
				G8	G8	F 9				-39V	" "
G4						H 9				-39V	" "
	G4					B 7				-24V	VEL
		G4	G4			D 7				-24V	" "
				G4	G4	F 7				-24V	" "
						H 7				-24V	" "
						B 11	10			-47V	BLUE
						H 11	9			BIAS CNT	W/RED
						B 1	11			115VAC	RED
						D 1	12			115VAC	BLACK
						A 6		H 34	H 24	-39V	W/ORG.
							1	B 24	B 24	YL LT.	W/VEL
							2	D 24	D 24	SSB	W/GRY.
							5	F 24	F 24	RR B	W/VIO.
							8	B 24	B 24	L.T.CND.	W/BLK
B5	B5	B5	B5	B5	B5		4	E 25	E 25	PREFIM	VIO.
							7	G 25	G 25	30IPS	GREY
						I 2				C.N.D.	
						C 2				C.N.D.	
						E 2				C.N.D.	
						G 2				C.N.D.	
						A 10				C.N.D.	
						C 10				C.N.D.	
						E 10				C.N.D.	
						G 10				C.N.D.	
						A 12				C.N.D.	
						C 12				C.N.D.	
						E 12				C.N.D.	
						G 12				C.N.D.	
						(A 4)	3			BIAS DRIVE	VEL.
						(C 4)	6			BIAS DRIVE	103 DECK +4DT.

DATA-INPUT SYSTEM INPUT DATA

SJ 1	SJ 2	SJ 3	SJ 4	SJ 5	SJ 6	SJ 17	SJ 18	CKT.
C 2						A 1		IN 1
B 3						C 1		IN 2
B 11						E 1		IN 3
C 12						G 1		IN 4
	C 2					B 2		IN 5
	B 3					D 2		IN 6
	B 11					F 2		IN 7
	C 12					H 2		IN 8
		C 2				A 3		IN 9
		B 3				C 3		IN 10
		B 11				E 3		IN 11
		C 12				G 3		IN 12
			C 2			B 4		IN 13
			B 3			D 4		IN 14
			B 11			F 4		IN 15
			C 12			H 4		IN 16
				C 2		A 5		IN 17
				B 3		C 5		IN 18
				B 11		E 5		IN 19
				C 12		G 5		IN 20
					C 2		A 1	IN 21
					B 3		C 1	IN 22
					B 11		E 1	IN 23
					C 12		G 1	IN 24
G 2						A 7		OUT 1
G 6						C 7		OUT 2
G 10						E 7		OUT 3
F 13						G 7		OUT 4
	G 2					B 8		OUT 5
	G 6					D 8		OUT 6
	G 10					F 8		OUT 7
	F 13					H 8		OUT 8
		G 2				A 9		OUT 9
		G 6				C 9		OUT 10
		G 10				E 9		OUT 11
		F 13				G 9		OUT 12
			G 2			B 10		OUT 13
			G 6			D 10		OUT 14
			G 10			F 10		OUT 15
			F 13			H 10		OUT 16
				G 2		A 11		OUT 17
				G 6		C 11		OUT 18
				G 10		E 11		OUT 19
				F 13		G 11		OUT 20
					G 2		A 7	OUT 21
					G 6		C 7	OUT 22
					G 10		E 7	OUT 23
					F 13		G 7	OUT 24
E 4						A 13		SS 1
E 6						C 13		SS 2
E 8						E 13		SS 3
E 10						G 13		SS 4
	E 4					B 14		SS 5
	E 6					D 14		SS 6
	E 8					F 14		SS 7
	E 10					H 14		SS 8

SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ13	SJ14	CKT.
		D 3				B 24		E 9
		A 6				D 24		E 10
		A 8				F 24		E 11
		D 9				H 24		E 12
			D 3			B 25		E 13
			A 6			D 25		E 14
			A 8			F 25		E 15
			D 9			H 25		E 16
				D 3		B 26		E 17
				A 6		D 26		E 18
				A 8		F 26		E 19
				D 9		H 26		E 20
					D 3		B 22	E 21
					A 6		D 22	E 22
					A 8		F 22	E 23
					D 9		H 22	E 24

SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ13	SJ14	CKT.
	D 1					A 13		RH 5
	E 2					B 14		RC 5
	A 2					C 13		RH 6
	A 4					D 14		RC 6
	A 12					E 13		RH 7
	A 10					F 14		RC 7
	D 13					G 13		RH 8
	D 11					H 14		RC 8
		D 1				A 15		RH 9
		E 2				B 16		RC 9
		A 2				C 15		RH 10
		A 4				D 16		RC 10
		A 12				E 15		RH 11
		A 10				F 16		RC 11
		D 13				G 15		RH 12
		D 11				H 16		RC 12
			D 1			A 17		RH 13
			E 2			B 18		RC 13
			A 2			C 17		RH 14
			A 4			D 18		RC 14
			A 12			E 17		RH 15
			A 10			F 18		RC 15
			D 13			G 17		RH 16
			D 11			H 18		RC 16
				D 1		A 19		RH 17
				E 2		B 20		RC 17
				A 2		C 19		RH 18
				A 4		D 20		RC 18
				A 12		E 19		RH 19
				A 10		F 20		RC 19
				D 13		G 19		RH 20
				D 11		H 20		RC 20
					D 1		A 11	RH 21
					E 2		B 12	RC 21
					A 2		C 11	RH 22
					A 4		D 12	RC 22
					A 12		E 11	RH 23
					A 10		F 12	RC 23
					D 13		G 11	RH 24
					D 11		H 12	RC 24
						A 21	A 21	GND.
						C 21	C 21	GND.
						E 21	E 21	GND.
						G 21	G 21	GND.
D 3						B 22		E 1
A 6						D 22		E 2
A 8						F 22		E 3
D 9						H 22		E 4
	D 3					B 23		E 5
	A 6					D 23		E 6
	A 8					F 23		E 7
	D 9					H 23		E 8

SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ13	SJ14	CKT.
H 3						A 1		PBH 1
H 1						B 2		PBC 1
H 7						C 1		PBH 2
H 5						D 2		PBC 2
H 11						E 1		PBH 3
H 9						F 2		PBC 3
H 13						G 1		PBH 4
G 12						H 2		PBC 4
	H 3					A 3		PBH 5
	H 1					B 4		PBC 5
	H 7					C 3		PBH 6
	H 5					D 4		PBC 6
	H 11					E 3		PBH 7
	H 9					F 4		PBC 7
	H 13					G 3		PBH 8
	G 12					H 4		PBC 8
		H 3				A 5		PBH 9
		H 1				B 6		PBC 9
		H 7				C 5		PBH 10
		H 5				D 6		PBC 10
		H 11				E 5		PBH 11
		H 9				F 6		PBC 11
		H 13				G 5		PBH 12
		G 12				H 6		PBC 12
			H 3			A 7		PBH 13
			H 1			B 8		PBC 13
			H 7			C 7		PBH 14
			H 5			D 8		PBC 14
			H 11			E 7		PBH 15
			H 9			F 8		PBC 15
			H 13			G 7		PBH 16
			G 12			H 8		PBC 16
				H 3		A 9		PBH 17
				H 1		B 10		PBC 17
				H 7		C 9		PBH 18
				H 5		D 10		PBC 18
				H 11		E 9		PBH 19
				H 9		F 10		PBC 19
				H 13		G 9		PBH 20
				G 12		H 10		PBC 20
					H 3		A 1	PBH 21
					H 1		B 2	PBC 21
					H 7		C 1	PBH 22
					H 5		D 2	PBC 22
					H 11		E 1	PBH 23
					H 9		F 2	PBC 23
					H 13		G 1	PBH 24
					G 12		H 2	PBC 24
D 1						A 11		RH 1
E 2						B 12		RC 1
A 2						C 11		RH 2
A 4						D 12		RC 2
A 1A						E 11		RH 3
A 10						F 12		RC 3
D 13						G 11		RH 4
D 11						H 12		RC 4

SJ1-SJ6-PREAMP

SJ13, SJ14-HEADS

SJ15, SJ16-INPUT-OUTPUT

SJ11-BIAS

JD-TO DECK

SJ15, SJ16-5⁺

OUT'S = PLAY

IN'S = REC

8214-TAPE SYSTEM - 525VHC PANEL

307

ST10	ST11	ST12	ST13	ST14	ST15	ST16	ST17	ST18	ST19	CHK.
							13A			SS 1
							13C			2
							13E			3
							13G			4
9B							14B			5
9D							14D			6
9F							14F			7
9H							14H			8
	9B						15A			9
	9D						15C			10
	9F						15E			11
	9H						15G			12
		9B					16B			13
		9D					16D			14
		9F					16F			15
		9H					16H			16
			9B				17A			17
			9D				17C			18
			9F				17E			19
			9H				17G			20
				9B				13A		21
				9D				13C		22
				9F				13E		23
				9H				13G		SS 24
					26		19A			RR 1
					27		19C			2
					28		19E			3
					29		19G			4
10A					30		20B			5
10C					31		20D			6
10E					32		20F			7
10G					33		20H			8
	10A				34		21A			9
	10C				35		21C			10
	10E				36		21E			11
	10G				37		21G			12
		10A				26	22B			13
		10C				27	22D			14
		10E				28	22F			15
		10G				29	22H			16
			10A			30	23A			17
			10C			31	23C			18
			10E			32	23E			19
			10G			33	23G			20
				10A		34		19A		21
				10C		35		19C		22
				10E		36		19E		23
				10G		37		19G		RR 24

Color code

RR 1-24

DATA TAPE SYSTEM - SEL-SYNC

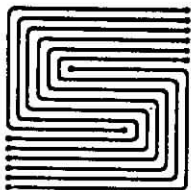
4 of 4

ST 10	ST 11	ST 12	ST 13	ST 14	ST 15	ST 16	ST 17	ST 18	ST 19	CKT.
										1
										2
										3
										4
11B										5
11D										6
11F										7
11H										8
	11B									9
	11D									10
	11F									11
	11H									12
		11B								13
		11D								14
		11F								15
		11H								16
			11B							17
			11D							18
			11F							19
			11H							20
				11B						21
				11D						22
				11F						23
				11H						24
					1					END 1
					2					2
					3					3
					4					4
12A					5					5
12C					6					6
12E					7					7
12G					8					8
	12A				9					9
	12C				10					10
	12E				11					11
	12G				12					12
		12A				1				13
		12C				2				14
		12E				3				15
		12G				4				16
			12A			5				17
			12C			6				18
			12E			7				19
			12G			8				20
				12A		9				21
				12C		10				22
				12E		11				23
				12G		12				24
13B	13B	13B	13B	13B						END
13D	13D	13D	13D	13D			6B, 12B	6B, 12B		END
13F	13F	13F	13F	13F			6D, 12D	6D, 12D		END
13H	13H	13H	13H	13H			6F, 12F	6F, 12F		END
							6H, 12H	6H, 12H		END
					39-50	39-50				END-BUS BAR
1B	1B	1B	1B	1B					30	END
1D	1D	1D	1D	1D			12B	12B		END
1F	1F	1F	1F	1F			12D	12D		END
1H	1H	1H	1H	1H			12F	12F		END
							12H	12H		END

MUTUAL

Label code

provided



STEPHENS ELECTRONICS, INC

MAINTENANCE REQUEST

Company Name:	RSC
Contact:	Bruce Bidlack
Phone #:	766 7191

Job #:	418
Date:	2/23/82
Date needed by:	ASA Practical

Last used: Ed Guene 151PS in I table

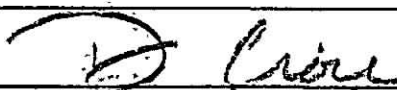
Repairs to be made: Servo not "reliable" / stable.

of lock meter swings (out of ^{lock} range condition)

Speed trim sometimes could adjust for phase lock but eventually could not trim servo into phase lock. [later went to "resolve" mode with no ext ref. to use free running / wild speed.] even in phase lock, there is excessive wavering of meter.

2 weeks ago we tried 1) increasing R of speed trim (added series resistor) at trim pot location 2) attempted to readjust photo K's at idler wheel.

Received by:



Stephens Electronics

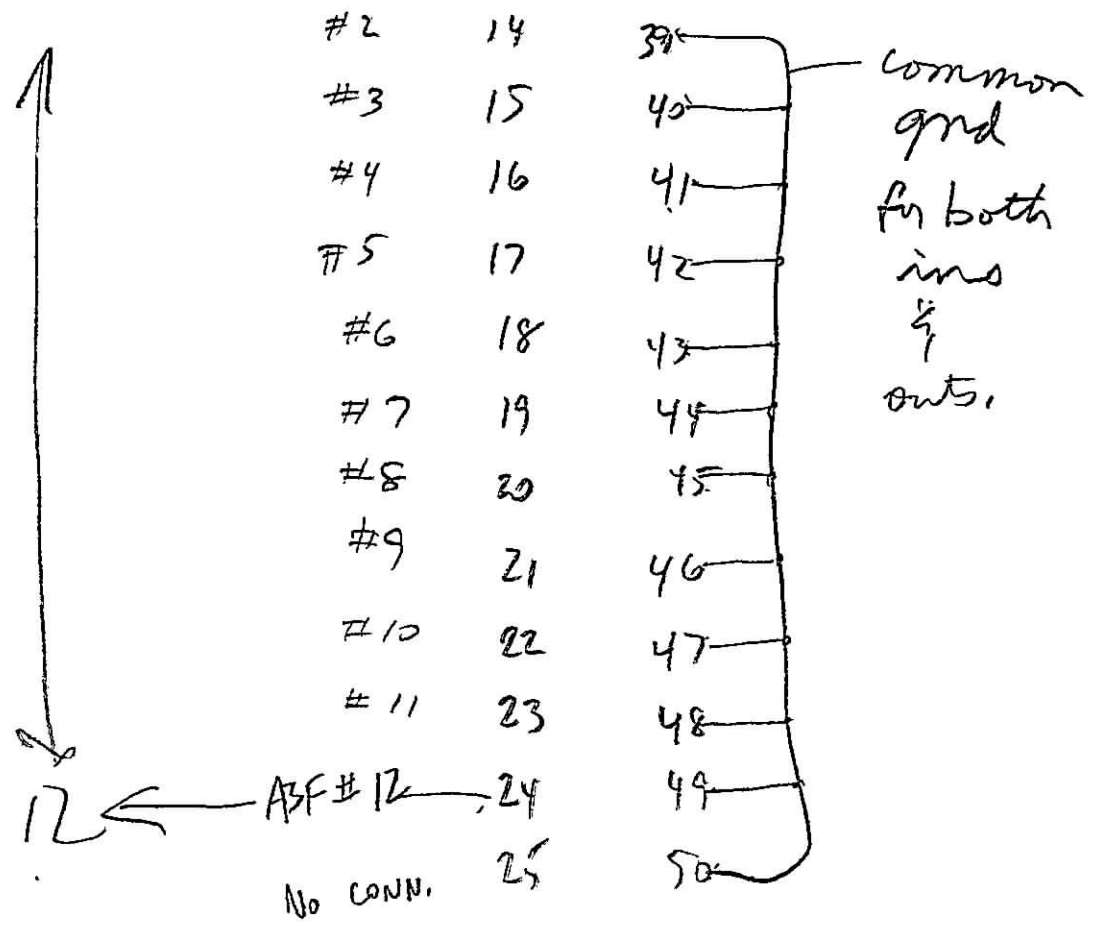
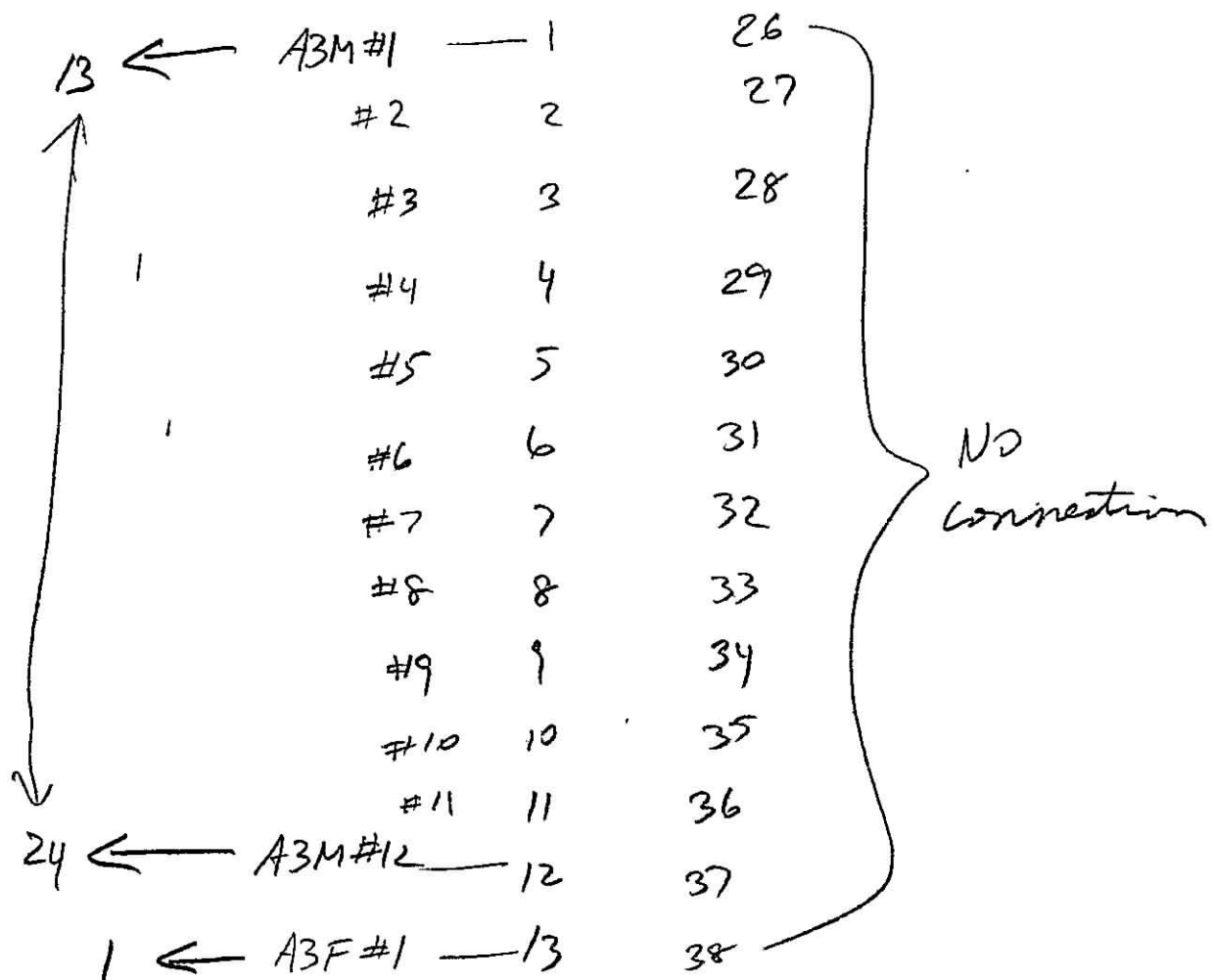
Picked up by:

Date:

- ☐ Pick up charges
☐ Delivery charges

Terms: ☐ C.O.D.
☐ Net 10 days

1382



Carl Jacobson
Professional Audio
(714) 870-4762

D A I L Y R E N T A L R A T E S

MICROPHONES
Continued

ELECTRO-VOICE

E.V.	DS35	UNI-DIRECTIONAL SUPER CARDIOID	\$ 9.00
E.V.	635A	OMNI-DIRECTIONAL	\$ 8.00
E.V.	RE15	UNI-DIRECTIONAL	\$ 10.00
E.V.	RE20	UNI-DIRECTIONAL	\$ 20.00

NEUMAN

NEUMAN	KM-84	STUDIO CONDENSER, CARDIOID	\$ 18.00
NEUMAN	KM-56	3 PATTERN TUBE CONDENSER	\$ 50.00
NEUMAN	M49	TUBE CONDENSER	\$100.00
NEUMAN	U47FET	CONDENSER	\$ 25.00
NEUMAN	U47VF14	TUBE	\$100.00
NEUMAN	U67	TUBE CONDENSER	\$100.00
NEUMAN	U87	STUDIO CONDENSER	\$ 25.00
NEUMAN	U89	STUDIO CONDENSER	\$ 30.00

RCA

RCA	44BX	RIBBON	\$ 30.00
RCA	77DX	RIBBON	\$ 30.00

SENNHEISER

SENN.	K3U	MODULAR CONDENSER SYSTEM	\$ 20.00
SENN.	MKH415	SHORT SHOTGUN	\$ 18.00
SENN.	MKH815	LONG SHOTGUN	\$ 20.00
SENN.	MD421	UNI-DIRECTIONAL, DYNAMIC	\$ 10.00
SENN.	MZN-16TU	POWER SUPPLY	\$ 5.00

ARNIE ^{converter} CARD with Madeline Servo
 pin V (Input PLL Unregulated) = 27.1
 C223 Regulated = 24.5 unchanging

ARNIE Card w/ Arnie Servo
 Input PLL Unregulated = 25.3
 C223 PLL Regulated = 24.4

ARNIE w/ Bill-D Servo =
 In = 26.2
 Reg = 24.5

ARNIE P.S.	UN Reg	60.4 59.8	Reg	46.5 46.5	moving
Bill-D	UnReg	58.7 58.2		40.0 40.0	moving
Madeline	UnReg	61.7 60.6		45.3 45.3	

Bill-D servo & Converter
 Input 26.3
 Reg 23.7 → 22.8 moving



RECORDING SERVICES COMPANY

10824 VENTURA BOULEVARD
STUDIO CITY, CA. 91604
(213) 766-7191

Report on 811-D Servo

I with Various Resolver card - 15ips

Voltage in PPL regulator		Play B	E.F. & Pencil
Stationary Voltage		Moving	
223	- 22.8	- 22.5	- 22.5
224	- 22.1	- 21.9	- 21.9

Speed TRIM has plenty of Range & Flutters @ either end of the pot, but is stable in center range.

224	- 23.9	- 23.9
223	- 24.6	- 24.6

Speed TRIM = Same as A

811D

224	- 23.1	22.3
223	- 23.8	23.1

changes

speed trim barely locks stably @ end of turn pot

11-5-81



RECORDING SERVICES COMPANY

RSC

Flutter Test - Stephens 821-B - arm?

	Head	Center	TAIL
TRK 12 .5 - 30 -		.06	.04
30 - 300 -	.03	.03	.05
300 - 5000 -	.08	.055	

	Head	Center	TAIL
HOLD BACK	8.3 v	9.6	10.8

	Stephens Head	821-A Center	Tail
TRK 11 .5 - 30	.06	.06	.05
30 - 300	.08	.1	.1
300 - 5000	.06	.05	.05

	Head	Center	TAIL
	10.5	10.5	10.6

slightly better

LINE VOLTAGE does change Holdback



RECORDING SERVICES COMPANY

2414 W. OLIVE AVE.
BURBANK CA. 91506
(818) 843-8640
(800) 451-5614

4/22/85

PACKING LIST FOR JAMACA/Warner Bros Pictures C#265 307

ALL ITEMS ARE MANUFACTURED IN THE UNITED STATES OF AMERICA.

- 1) STEPHENS 821A 24-TRACK RECORDER SN# 1040 Value of 21,000.00
- 2) 25 XLR FEMALE X TT PATCH CORDS. RSC OWNED VALUE OF \$500.
- 3) 25 XLR MALE X TT PATCH CORDS. RSC OWNED VALUE OF \$500.
- 4) ONE 220V TO 110V STEP DOWN TRANSFORMER VALUE \$20.00
- 5) STEPHENS SPARE PARTS KIT (HOPEFULLY NOT NEEDED)
- 6) ONE 2" X 10 1/2" EMPTY TAKE UP REEL.
- 7) ONE 2" SPLICE BLOCK NO S/N# VALUE \$100.
- 8) ONE ROLL 250 X 2" X 2500' TAPE FROM STEVE GOLMAN.
- 9) OPERATIONS MANUAL FOR STEPHENS.

by Juliet A. McKinnon RSC
JULIET A. MCKINNON



RECORDING SERVICES COMPANY

2414 W. OLIVE AVE.
BURBANK CA. 91506
(818) 843-8640
(800) 451-5614

4/20/85

JAMACA/WARNER BROS. PICTURES

TO AUDIO ENGINEER:

HINTS ON STEPHENS OPERATION:

The machine has been aligned for +6, 30ips, 250 tape, using the sample tape given us by Steve Goldman. All functions check out 100%. If you need assistance, call RSC 800-451-5614, or (818) 843-6800, talk to Julie or Tom or Ken.

Tones have been recorded on the reel of 250 tape at the head. I suggest if they playback even close to 0 VU in Jamaca, not to realign. If realignment is necessary overbias 1 db @ 1 K for best flat frequency response. DO NOT adjust low frequency response, it should be close to 0 VU.

Enclosed is a 220 V to 110 V step down transformer for the machine. We think the Power in Jamaca is 50 hz, 220 V, so PLEASE use the transformer for the Stephens machine. Also, please try to get as much air as possible to the Power Supply since it will probably get warmer than normal running on 50 hz.

The speed of the machine uses a 60 hz crystal time base so the Jamaca 50hz. will not be a problem - only the 220V.

At the rear of the machine is a switch for external sync resolving. IMPORTANT the switch is in the "NORMAL" POSITION, at all times. Please check upon arrival in Jamaca.

To arm machine for record use the knob on the right hand side of the VU meter panel while depressing the "REC" button next to it (NOT DECK record button). This is also used for the other functions - input, Play, Mute (you won't need Mute). Depress the "play" one to deselect from record ready.

All other functions of the machine are very similar to any studio recorder, the enclosed manual covers tape threading etc. however refer to the previous paragraph for Channel select functions on the multiplexing of the VU panel.

TROUBLE REPORT

Date:

5/17

Your name:

ERIC

Client/job
contact/phone

() 1200 () A

() B

() ATR100 () C

() D

() _____

arne

Stephens B

24 TRK

Nature of problem as first noted:
(how long machine running, settings,
how discovered, etc.)Channels 3 and 18 did not
seem to work in RECORD.
They did work in Playback

Initial corrective action taken:

Reseated Relays and both channels (3+18)
worked. Relay contacts seem somewhat intermittent
by JM? ↗

Other clues:

Meters did not move at all

→ machine worked fine when I tried it
Relay sockets are somewhat loose
(meters were fine.)

Thank you for taking the time to fill out this form.

RECORD.

'66-7191

TROUBLE REPORT

() 1200 () A
() B
() ATR 100 () C
() Signs () D

Date:

Your name:

Client/job
contact/phone

T.H. 1

821-A (B)

Nature of problem as first noted:
(how long machine running,
settings, how discovered, etc.)

Tape After Binds - Doesn't
Eft Tape properly.

~~Initial~~ corrective action taken: 1/14/82

tightened allen screws
② shaft + solenoid junction
Jff

Other clues:

Thank you for taking the time to fill out this form.

TROUBLE REPORT

Date:

6-21-83

Your name:

Jon

Client/job

STEREOTER

contact/phone

821

() 1200 () A

() B

() ATR100 () C

() D

() _____ () E

() F

() Ad-Sm () _____

() Q Lock

() DOLBY _____

Circle: 7 1/2 15 30 ips +3

(other)

250 456

(other)

PBO

Nature of problem as first noted:

(how long machine running, settings, how discovered, etc.)

COULD NOT ESTABLISH THAT DISTORTION IS A COMMON CHANNEL MISMATCH

CH 1, 2, 4 GOT D3 of $.11 \pm .02$

CH 3 GOT D3 of $.29 \pm .04$ @ QDB SOURCE TUNE

Initial corrective action taken:

HOWEVER, EXCESSIVE FLUTTER IS DIRECTLY VISIBLE BY WATCHING THE FLUCTUATIONS IN THE mA METER ON TOP, WHILE MONITORING FL OUTPUT IN JBL'S. IS THIS CAUSED BY TAPE SLIPPAGE, OR THE SPEED COMPENSATOR BEING TOO SLO, OR VARIATIONS IN PWR SUPPLY?

Thank you for taking the time to fill out this form.

TROUBLE REPORT

Date: 6-24-83

Your name: *Bohney*

Client/job *Unitel*
contact/phone

() 1200 () A

() B

() ATR100 () C

() D

(x) *Stephen* () E

() F

() Ad-Sm *16+rlc*

() Q Lock

() DOLBY

Circle: 7½ 15 30 ips +3 250 456 PBO
(other) (other)

Nature of problem as first noted:

(how long machine running, settings,
how discovered, etc.)

*Punch Out Button was dangling
and screw chassis stripped.*

Should remove switch completely @

Initial corrective action taken:

*with switch mount ←
off there was enough "meat"
left on existing threads.*

No further action (no new threads)

*→ Switch removed. Some R's+C's
& wires to A/S interface remain. will
remove soon as I figure out what it*

Thank you for taking the time to fill out this form.

is. B. 6/29

TROUBLE REPORT

Date: 5/11/82

Your name: Ken

Client/job
contact/phone Paramount☐ 1200 ☐ A☐ ATR 100 ☐ B☐ Stewers ☐ C☐ 8trk ☐ D

Nature of problem as first noted:
(how long machine running,
settings, how discovered, etc.)

Playback HF Ch. 1 Pot broken,
Playback HF Ch. 3 Pot not enough
resistance to make ϕ V.U.

Initial corrective action taken:

Replaced Ch. 1 pot H.F.,
Added resistor to Ch 3. pot H.F.
in series

Other clues:

TROUBLE REPORT

() 1200 () A
() B
() ATR100 () C
() D

Date: 12/19/81

() STEREO 81/C

Your name: JOHN FROST

Client/job
contact/phone

Nature of problem as first noted:
(how long machine running, settings,
how discovered, etc.)

Trim Pot ON TRACK 4
HF PBEQ MUST be replaces,
(shipped beyond usage)

Initial corrective action taken:

FOUND OUT RSC. HAS 10
Stemens trim Pots

Other clues:

merry christmas
Replaced pot 11/6/82 w/ Stemens replacement pot
J.P.

Thank you for taking the time to fill out this form.

TROUBLE REPORT

Date: 10/27/82

Your name: Jeff

Client/job
contact/phone

() 1200	() A
	() B
() ATR 100	() C
	() D
() <u>Stepdens</u>	() E
	() F
() Ad-Sm	() _____
() Q Lock	
() DOLBY	_____

Circle: $7\frac{1}{2}$ 15 30 ips +3 _____ 250 456 _____ PEO
(other) (other)Nature of problem as first noted:(how long machine running,
settings, how discovered, etc.)

One channel stuck in input
at 30 ips only. 15 ips OK

Initial corrective action taken:

15/30ips Low Freq EQ swithing
Fet Bad, Replaced. It works

Jeff 10/27/82

RECORDING SERVICES COMPANY 766-7191

TROUBLE REPORT

Date: 2-8-83

Your name: Rodney

Client/job
contact/phone

() 1200 () A
() B
() ATR100 () C
() D
() Stephens () E
() F 16 trK
() Ad-Sm ()
() Q Lock
() DOLBY _____

Circle: 7½ (15 30) ips +3 _____ 250 456 _____ PBO
(other) (other)

Nature of problem as first noted:
(how long machine running, settings,
how discovered, etc.)

Machine is stuck in Fast Forward

While rocking machine to a stop from Rewind,
the problem occurred.

Initial corrective action taken:

F.F. Switch was stuck on.

Worked it a bit, seems OK now.

Rodney

2-8-83

Thank you for taking the time to fill out this form.

TROUBLE REPORT

Date: 6-12-83

Your name: JOL

Client/job BART
contact/phone

() 1200 () A
() B
() ATR100 () C
() D
() E
() F
() Ad-Sm
() Q Lock
() DOLBY
STEPHENS 8110

Circle: 7½ 15 30 ips +3 250 456 PBO
(other) (other)

Nature of problem as first noted:
(how long machine running, settings,
how discovered, etc.)

~~1. PUNCHOUT BUTTON NOT CONSISTENT.~~
SOMETIMES LOSE FF & REW COMMANDS
WITH NO APPARENT REASON
6-16
KEED 8110 BY FRI 6-17
→ fast FF & RWD "rocking" action.

Initial corrective action taken:

② BART HAD MUCH TROUBLE RECORDING
& PLAYING BACK. RELAYS SEEMED
UNSTABLE, TRACK TO TRACK, & HE
TRIED SWAPPING, ETC. TO BE ABLE
TO FINISH RECORDING. MAYBE IT'S THE
MOUNTING OF THE RELAYS.

Trashed out relays from 821A

6-14-83

Paul W. S.W. / Rd

Thank you for taking the time to fill out this form.

RECORDING SERVICES COMPANY 766-7191

TRouble REPORT

Date: 9-20-83

Your name: Jon

Client/job LAS VEGAS
contact/phone

ARRIVE
STEPHENS
() 1200 () A
() B
() ATR100 () C
() D
() () E
() F
() Ad-Sm ()
() Q Lock
() DOLBY

Circle: 7½ 15 30 ips +3 250 456 PBO
(other) (other)

Nature of problem as first noted:

(how long machine running, settings,
how discovered, etc.)

FLUTTER ANDIBLE & UNSTABLE
AT 15 IPS. & 30 IPS., 10½" REELS
OTHER FUNCTIONS SEEM
FINE.

Initial corrective action taken:

Adjusted Servo

9-20-83

BB & Rod

Thank you for taking the time to fill out this form.

Cables all work. Every channel erases & repros

Red

9-20-83

OK per Julie. 9/20

TROUBLE REPORT

Date: 7/22/84

Your name: Bruce

Client/job
contact/phone Mix@RSC

() 1200 () A

() B

() ATR100() C

() D

☒ Steplung() E

() F

() Ad-Sm ☒ 821A 24r

() Q Lock

() DOLBY _____

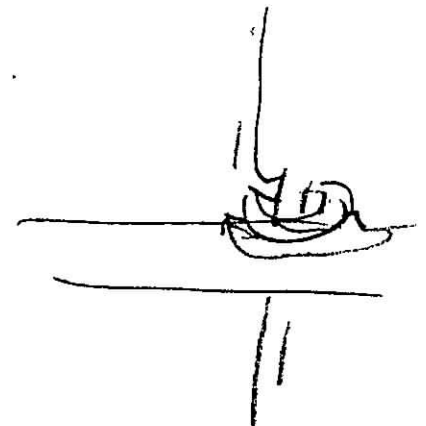
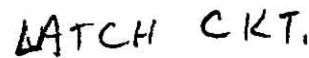
Circle: 7½ ☒ 15 30 ips ☒ 15 (other) 250 456 ☒ PBO (other)Nature of problem as first noted:(how long machine running, settings,
how discovered, etc.)

Takeup motor has bearing/brush
noise (Thump once per revolution)
No apparent audible effect, yet.

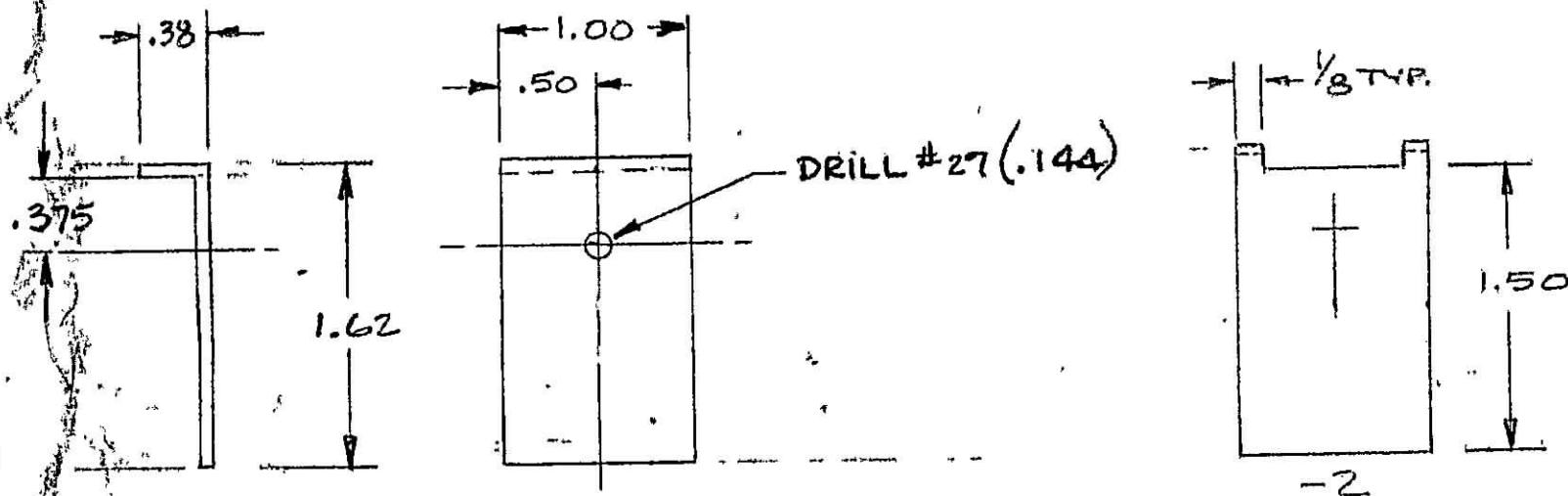
Initial corrective action taken: None.

Record Latch off
Latch dropout prevention

Lower's R40's
effective resistor
thus causing more
current to flow
from Q17 Base
2N3702 thus
turning
on Q16
if intensity
turns on Q16
harder which
keeps Q17
base on



REVISIONS		
SYM.	DESCRIPTION	DATE
A	FINISH - BLACK ANODIZE	3-29-78
B	ADDED DASH NOS.	3/30/78



MAT'L: 1/16 ALUM - 6061-T6
 (A) = FINISH: ALODINE

DASH NO.	CONDITION
-1	WITHOUT NOTCH
-2	WITH NOTCH

XX = ±.010 XXX = ±.005

STEPHENS ELECTRONICS, INC.

SCALE: FULL

APPROVED BY:

DRAWN BY GEIER

DATE: 1/10/74

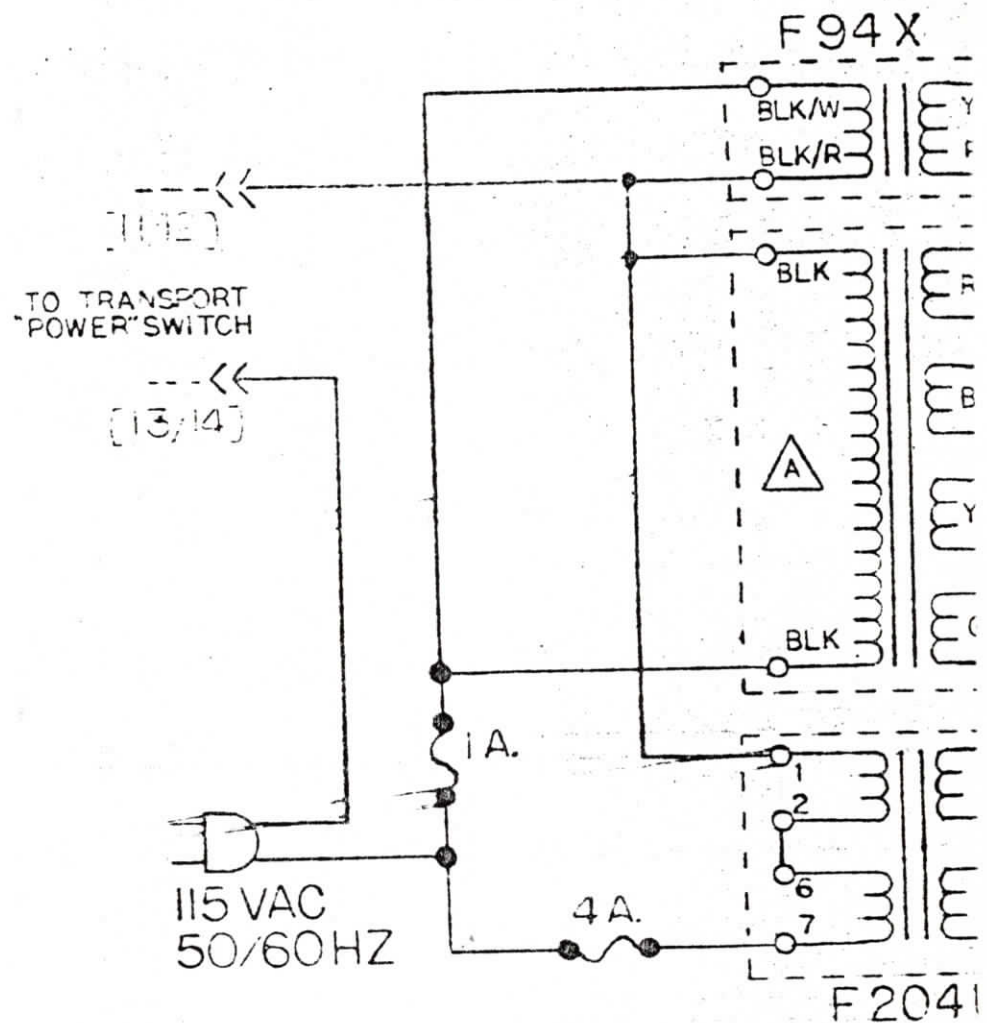
REVISED

CLIP - YU METER RETAINING

MODEL 821A-24

DRAWING NUMBER
 110520B

STEPHENS ELECTRONIC



NOTES:



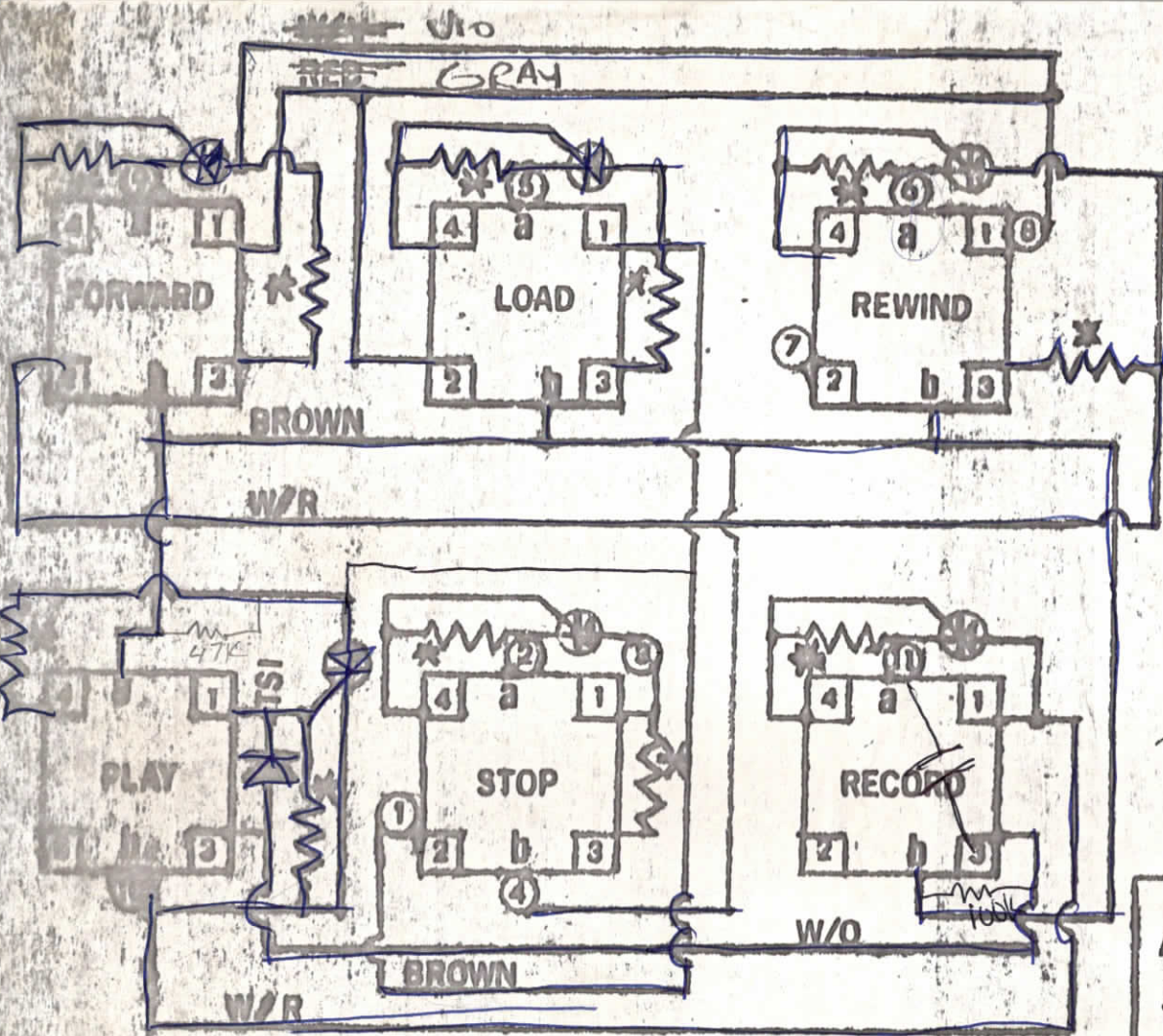
F92A XFMR IN 4/16 SUPPLY
F63U " " 24-40 "

Q1, Q2 INT'L RECTIFIER TR-02

Q3 " " TR-05



CONNECTOR PIN NO'S



AMPHENAL 57-30360 CONNECTOR

- 1 BROWN LOAD 1
- 2 RED STOP A
- 3 ORANGE STOP B
- 4 YELLOW LOAD B
- 5 GREEN LOAD A
- 6 BLUE REWIND A
- 7 VIOLET REWIND 2
- 8 GREY LOAD 2
- 9 WHITE FORWARD A
- 10 BLACK REWIND 1
- 11 W/YELLOW RECORD A
- 18 W/VIOLET PANEL (GRND) 50 pin
- 21 W/BLUE
- 22 W/RED
- 23 W/GREEN
- 24 W/BLACK
- 27-29 JUMPER
- 31-32 JUMPER
- 12-17 19-20-25-26-28 NO CONNECTION

SWITCHES

VSO

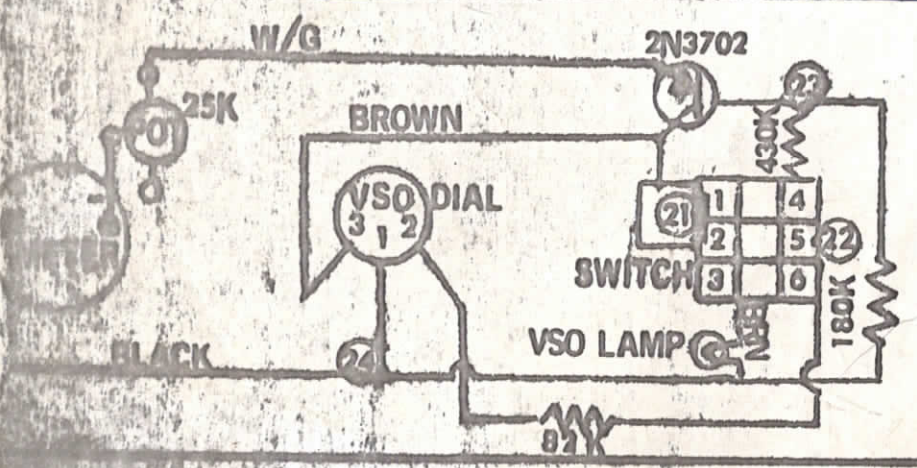
SCHEMATIC

ALL SCR - TIC 45
SWITCH -



NOTES

150 Ω - *



REMOTE SHUTTLE

SCALE:	APPROVED:	DRAWN BY: <i>S. M. H. JACOB</i>
DATE: 10-12-77		REVIEWED:
36 Pin Connect OLD STYLE		
821 A ONLY		DRAWING NUMBER:

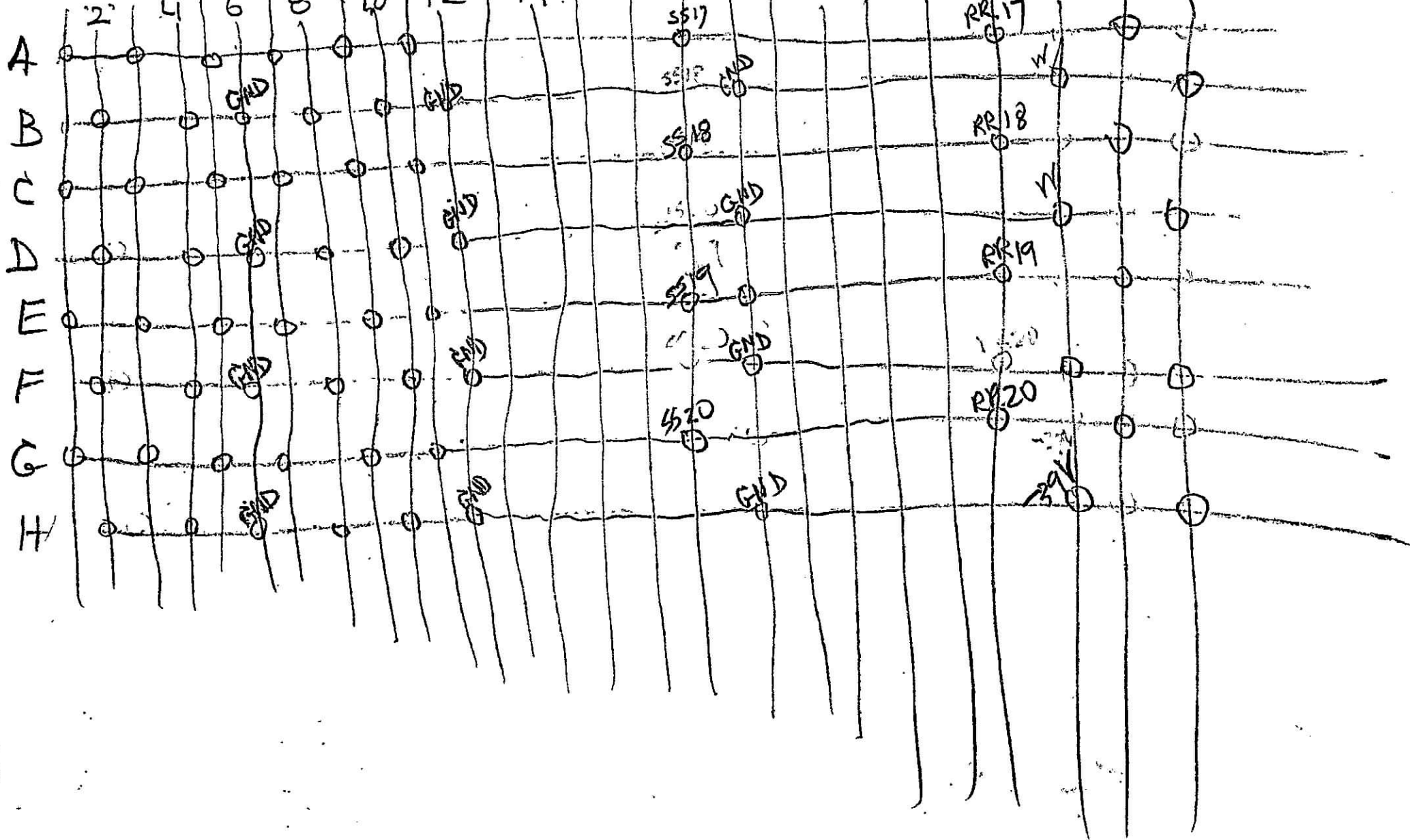
17 19 21 23 25

2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100
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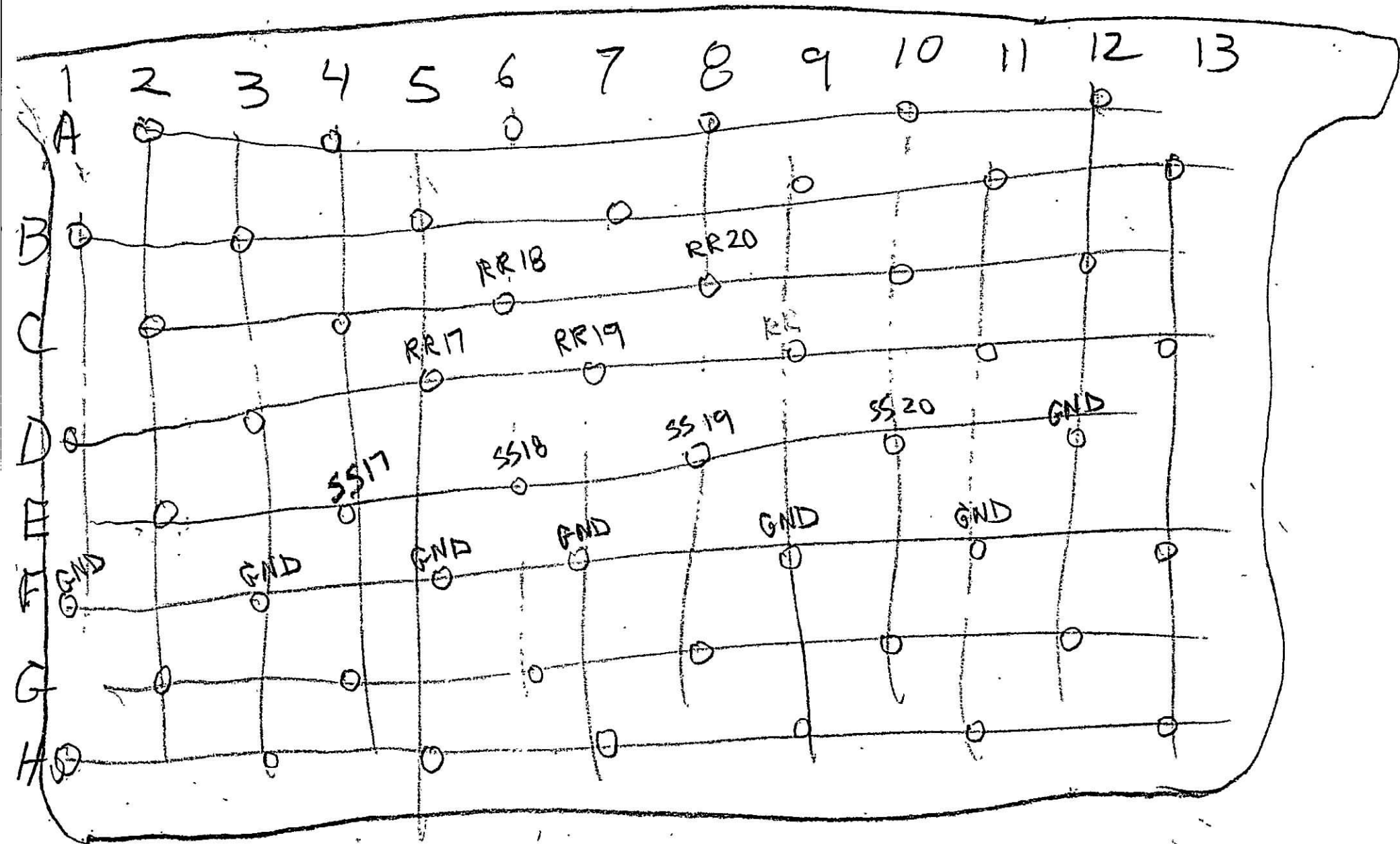
[illegible][illegible][illegible][illegible][illegible][illegible][illegible]

4 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

1 1 3 5 7 9 11 13 15 17 19 21 23 25 26



Rear View STEPHENS SJ - Connectors



SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ11	JD	SJ17	SJ18	CKT	WIR
B7						B13				BIAS	SHIE
	B7					D13				BIAS	"
		B7	B7			E13				BIAS	"
				B7	B7	H13				BIAS	"
G8						B9				-39V	ORG
	G8					D9				-39V	"
		G8	G8			F9				-39V	"
				G8	G8	H9				-39V	"
E4						B7				-24V	YE
	G4					D7				-24V	"
		G4	G4			F7				-24V	"
				E4	G4	H7				-24V	"
						B11	10			-47V	BLU
						H11	9			BIAS CEN	W/R
						B1	11			115VAC	RE
						D1	12			115VAC	BLA
						A6		H24	H24	-39V	W/OK
							1	B24	B24	12. LT.	W/VL
							2	D24	D24	SSB	W/GR
							5	F24	F24	RRB	W/VI
							8	B26	B26	LT. GND	W/124
							4	E25	E25	PRELIM	VIO
B5	B5	B5	B5	B5	B5		7	G25	G25	30 IPS	GRE
						A8				GND.	
						C8				GND.	
						E8				GND.	
						G8				GND.	
						A10				GND.	
						C10				GND.	
						E10				GND.	
						G10				GND.	
						A12				GND.	
						C12				GND.	
						E12				GND.	
						G12				GND.	
						A4	3			BIAS DRIVE	VE
						C4	6			BIAS DRIVE	103 DE

TAPE SYSTEM - SEL-SYNC

4 of 4

ST 10	ST 11	ST 12	ST 13	ST 14	ST 15	ST 16	ST 17	ST 18	ST 19	CHT
										1
										2
										3
11 B										4
11 D										5
11 F										6
11 H										7
	11 B									8
	11 D									9
	11 F									10
	11 H									11
		11 B								12
		11 D								13
		11 F								14
		11 H								15
			11 B							16
			11 D							17
			11 F							18
			11 H							19
				11 B						20
				11 D						21
				11 F						22
				11 H						23
										24
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										99
										100

Micro

Label on disk

Refined

GND-BUS BAR

84A--TAPR SYSTEM 525 SYNC PANEL

5 of 4

SJ10	SJ11	SJ12	SJ13	SJ14	SJ15	SJ16	SJ17	SJ18	SJ19	CRT.
							13A			SS 1
							13C			2
							13E			3
							13G			4
9B							14B			5
9D							14D			6
9F							14F			7
9H							14H			8
	9B						15A			9
	9D						15C			10
	9F						15E			11
	9H						15G			12
		9B					16B			13
		9D					16D			14
		9F					16F			15
		9H					16H			16
			9B				17A			17
			9D				17C			18
			9F				17E			19
			9H				17G			20
				9B				18A		21
				9D				18C		22
				9F				18E		23
				9H				18G		SS 24
					26		19A			RR 1
					27		19C			2
					28		19E			3
					29		19G			4
10A					30		20B			5
10C					31		20D			6
10E					32		20F			7
10G					33		20H			8
	10A				34		21A			9
	10C				35		21C			10
	10E				36		21E			11
	10G				37		21G			12
		10A				26	22B			13
		10C				27	22D			14
		10E				28	22F			15
		10G				29	22H			16
			10A			30	23A			17
			10C			31	23C			18
			10E			32	23E			19
			10G			33	23G			20
				10A		34		19A		21
				10C		35		19C		22
				10E		36		19E		23
				10G		37		19G		RR 24

231A-TAPE SYSTEM MULTI-CONN. BRK

5 of 6

OK

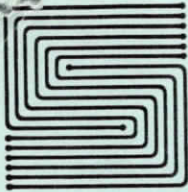
SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ17	SJ18	CKT.
		E 4				A 15		SS 9
		E 6				C 15		SS 10
		E 8				E 15		SS 11
		E 10				G 15		SS 12
			E 4			B 16		SS 13
			E 6			D 16		SS 14
			E 8			F 16		SS 15
			E 10			H 16		SS 16
				E 4		A 17		SS 17
				E 6		C 17		SS 18
				E 8		E 17		SS 19
				E 10		G 17		SS 20
					F 4		A 13	SS 21
					E 6		C 13	SS 22
					E 8		E 13	SS 23
					E 10		G 13	SS 24
5						A 19		RR 1
6						C 19		RR 2
7						E 19		RR 3
8						G 19		RR 4
	D 5					B 20		RR 5
	C 6					D 20		RR 6
	D 7					F 20		RR 7
	C 8					H 20		RR 8
		D 5				A 21		RR 9
		C 6				C 21		RR 10
		D 7				E 21		RR 11
		C 8				G 21		RR 12
			D 5			B 22		RR 13
			C 6			D 22		RR 14
			D 7			F 22		RR 15
			C 8			H 22		RR 16
				D 5		A 23		RR 17
				C 6		C 23		RR 18
				D 7		F 23		RR 19
				C 8		H 23		RR 20
					D 5		A 19	RR 21
					C 6		C 19	RR 22
					D 7		E 19	RR 23
					C 8		G 19	RR 24
1	F 1	E 1	F 1	F 1	F 1	B 6	B 6	GND.
3	E 3	F 3	F 3	F 3	F 3	D 6	D 6	GND.
5	F 5	E 5	F 5	F 5	F 5	F 6	F 6	GND.
7	F 7	F 7	F 7	F 7	F 7	H 6	H 6	GND.
9	F 9	F 9	F 9	F 9	F 9	B 12	B 12	GND.
11	F 11	F 11	F 11	F 11	F 11	D 12	D 12	GND.
12	E 12	F 12	E 12	E 12	E 12	F 12	F 12	GND.
						H 12	H 12	GND.
						B 18	B 18	GND.
						D 18	D 18	GND.
						F 18	F 18	GND.
						H 18	H 18	GND.

21A-TAPE SYSTEM MULTI-CONN. BRK

5 of 6

11	SJ2	SJ3	SJ4	SJ5	SJ6	SJ17	SJ18	CKT.
		E 4				A 15		SS 9
		E 6				C 15		SS 10
		E 8				E 15		SS 11
		E 10				G 15		SS 12
			E 4			B 16		SS 13
			E 6			D 16		SS 14
			E 8			F 16		SS 15
			E 10			H 16		SS 16
				E 4		A 17		SS 17
				E 6		C 17		SS 18
				E 8		E 17		SS 19
				E 10		G 17		SS 20
					F 4		A 13	SS 21
					E 6		C 13	SS 22
					E 8		E 13	SS 23
					E 10		G 13	SS 24
5						A 19		RR 1
6						C 19		RR 2
7						E 19		RR 3
8						G 19		RR 4
	D 5					B 20		RR 5
	C 6					D 20		RR 6
	D 7					F 20		RR 7
	C 8					H 20		RR 8
		D 5				A 21		RR 9
		C 6				C 21		RR 10
		D 7				E 21		RR 11
		C 8				G 21		RR 12
			D 5			B 22		RR 13
			C 6			D 22		RR 14
			D 7			F 22		RR 15
			C 8			H 22		RR 16
				D 5		A 23		RR 17
				C 6		C 23		RR 18
				D 7		E 23		RR 19
				C 8		G 23		RR 20
					D 5		A 19	RR 21
					C 6		C 19	RR 22
					D 7		E 19	RR 23
					C 8		G 19	RR 24
1	F 1	F 1	F 1	F 1	F 1	B 6	B 6	GND.
3	F 3	F 3	F 3	F 3	F 3	D 6	D 6	GND.
5	F 5	F 5	F 5	F 5	F 5	F 6	F 6	GND.
7	F 7	F 7	F 7	F 7	F 7	H 6	H 6	GND.
9	F 9	F 9	F 9	F 9	F 9	B 12	B 12	GND.
11	F 11	F 11	F 11	F 11	F 11	D 12	D 12	GND.
12	E 12	F 12	E 12	E 12	E 12	F 12	F 12	GND.
						H 12	H 12	GND.
						B 18	B 18	GND.
						D 18	D 18	GND.
						F 18	F 18	GND.
						H 18	H 18	GND.

SJ1	SJ2	SJ3	SJ4	SJ5	SJ6	SJ7	PS	SJ17	SJ18	ERT	WI
B7	B7	B7	B7	B7	B7	D 13				BIAS	SH
						D 13				BIAS	SH
						F 13				BIAS	SH
						H 13				BIAS	SH
						B 9				-39V	OK
						D 9				-39V	OK
						F 9				-39V	OK
						H 9				-39V	OK
						B 7				-24V	OK
						D 7				-24V	OK
						F 7				-24V	OK
						H 7				-24V	OK
						B 11	10			-47V	OK
						H 11	9			BIAS CATH	WI
						B 1	11			115VAC	OK
						D 1	12			115VAC	OK
						A 10		H 24	H 24	-39V	WI
							1	B 24	B 24	12. LT.	WI
							2	D 24	D 24	SSB	WI
							5	F 24	F 24	RRB	WI
							8	B 26	B 26	LT. CND	WI
							4	E 25	E 25	PRELIM	V.
							7	G 25	G 25	30 IPS	OK
						A 8				GND.	
						C 8				GND.	
						E 8				GND.	
						G 8				GND.	
						A 10				GND.	
						C 10				GND.	
						E 10				GND.	
						G 10				GND.	
						A 12				GND.	
						C 12				GND.	
						E 12				GND.	
						G 12				GND.	
						A 4	3			Bias DRIVE	V
						C 4	10			Bias DRIVE	100



STEPHENS ELECTRONICS, INC

3513 PACIFIC AVENUE, BURBANK, CALIFORNIA 91505

PHONE: (213) 842-5116

SENSOR ALIGNMENT

For the following procedure, the operator should be knowledgeable about the use of an oscilloscope. Be sure to ground the scope to the chassis of the machine before starting the alignment procedure.

1. Remove head shield carriers to get access to sensors.
2. Center SYM and 90 SYM pots.
3. Connect scope to TP:6, and set for .02 volts/div., internal positive trigger.
4. Rotate BAL pot fully clockwise. With tape loaded, and deck in play mode, adjust Sensor 2 for maximum amplitude with minimum amplitude variation.

WARNING: Use extreme caution when adjusting sensors not to hit the encoded disk. Hitting the disk with a screwdriver or the inner surface of the sensor can cause permanent damage to the disk.



5. Rotate BAL pot fully counter clockwise. With the same above conditions, adjust Sensor 1 for maximum amplitude with minimum amplitude variation.

When completed, both sensor assemblies should be pointing toward the center of the drum shaft.

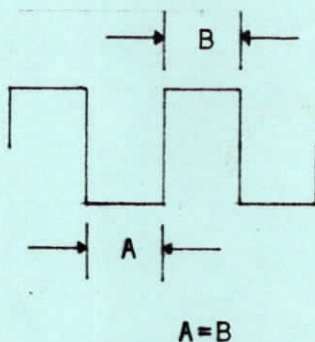
6. Center BAL pot. Rotate Sensor 1 and BAL pot for minimum amplitude on scope. Increase gain of scope for accuracy if necessary. Deck may run wild.

Do not readjust BAL pot for the rest of the alignment procedures.

7. Rotate Sensor 1 slightly for maximum amplitude with minimum amplitude variations.

This completes alignment of Sensors 1, 2 and the BAL pot.

8. Connect scope to TP 7. With deck in play mode adjust scope for display of square wave. Adjust SYM pot for symmetry of the square wave.

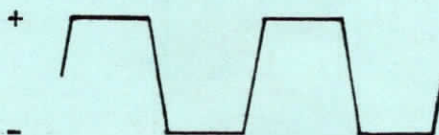


9. Connect scope to TP 5. Adjust scope for positive trigger. Reduce gain and adjust sweep for a display of four pulses. The first pulse should be at the start of the trace. Pulses two and three should be closely spaced together at the center of the screen with the fourth pulse at the far right side.



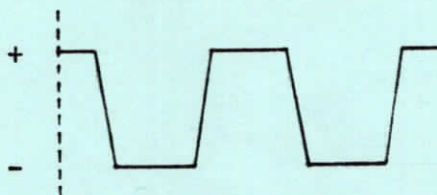
Adjust SYM pot so that pulse two is aligned on top of pulse three. This completes alignment of the SYM pot.

10. Connect scope to TP 1. With deck in play mode, adjust scope to display waveform. Adjust Sensor 3 for maximum amplitude with minimum amplitude variation. Adjust 90 SYM pot for symmetry of waveform.



11. Connect external trigger of scope to TP 2. With deck in play mode, switch scope to external positive trigger. Adjust trigger for a stable pattern.

12. Rotate Sensor 3 so that the scope trace starts with half of the positive portion of the square wave.



13. Run deck in rewind mode. The left side of the scope trace should now start with the negative portion of the square wave. If the slope of the square wave shows at the start of the trace, readjust Sensor 3. For better clarity of waveform, increase scope sweep speed.

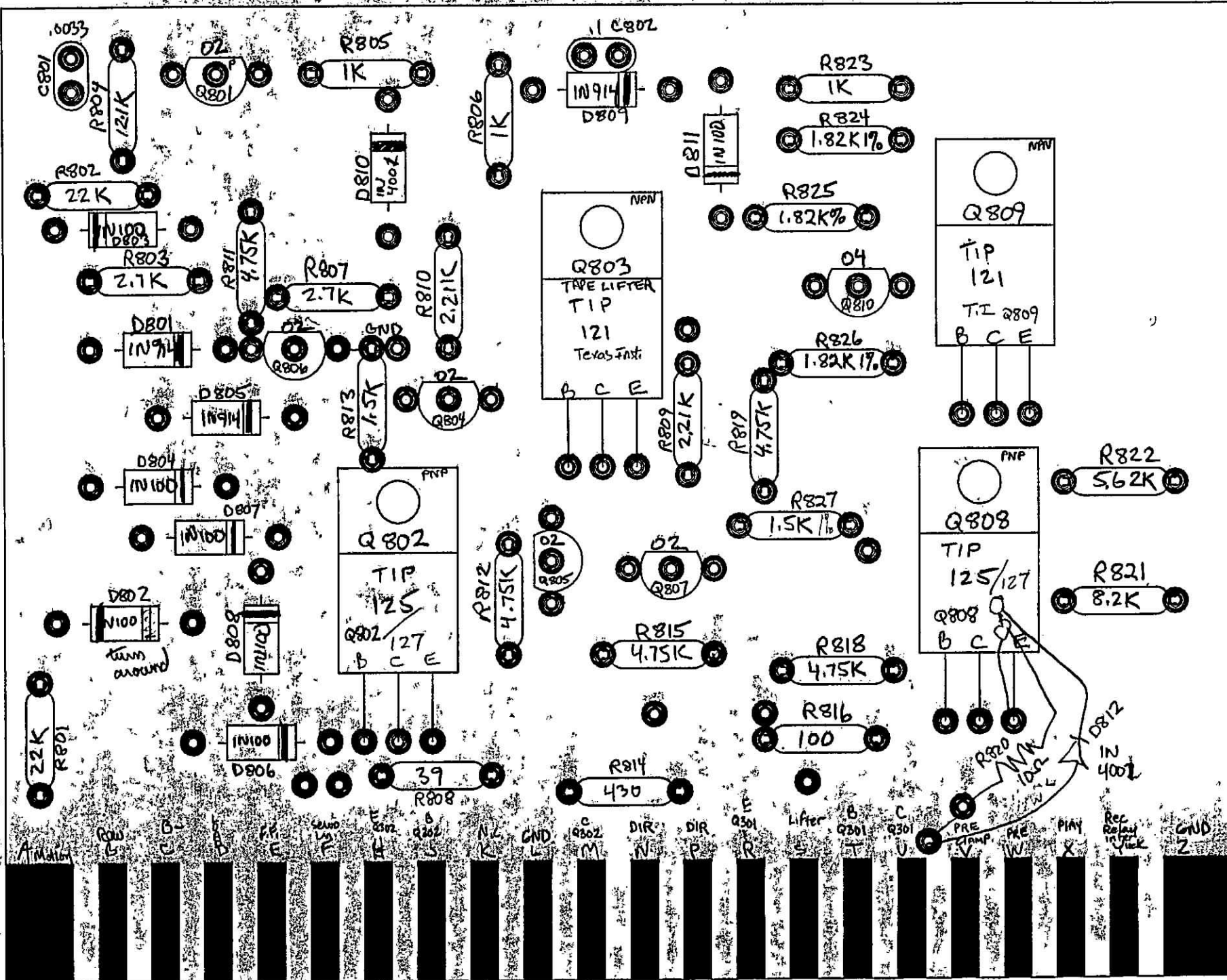
14. Run deck in fast forward mode. Trace should start with the positive portion of the square wave during acceleration and deceleration. If the slope of the square wave shows at the start of the trace, readjust Sensor 3.

Sensor alignment is complete when, with deck operating at any shuttle speed in either direction, scope trace starts with no slope showing.

11-17-79 JFS

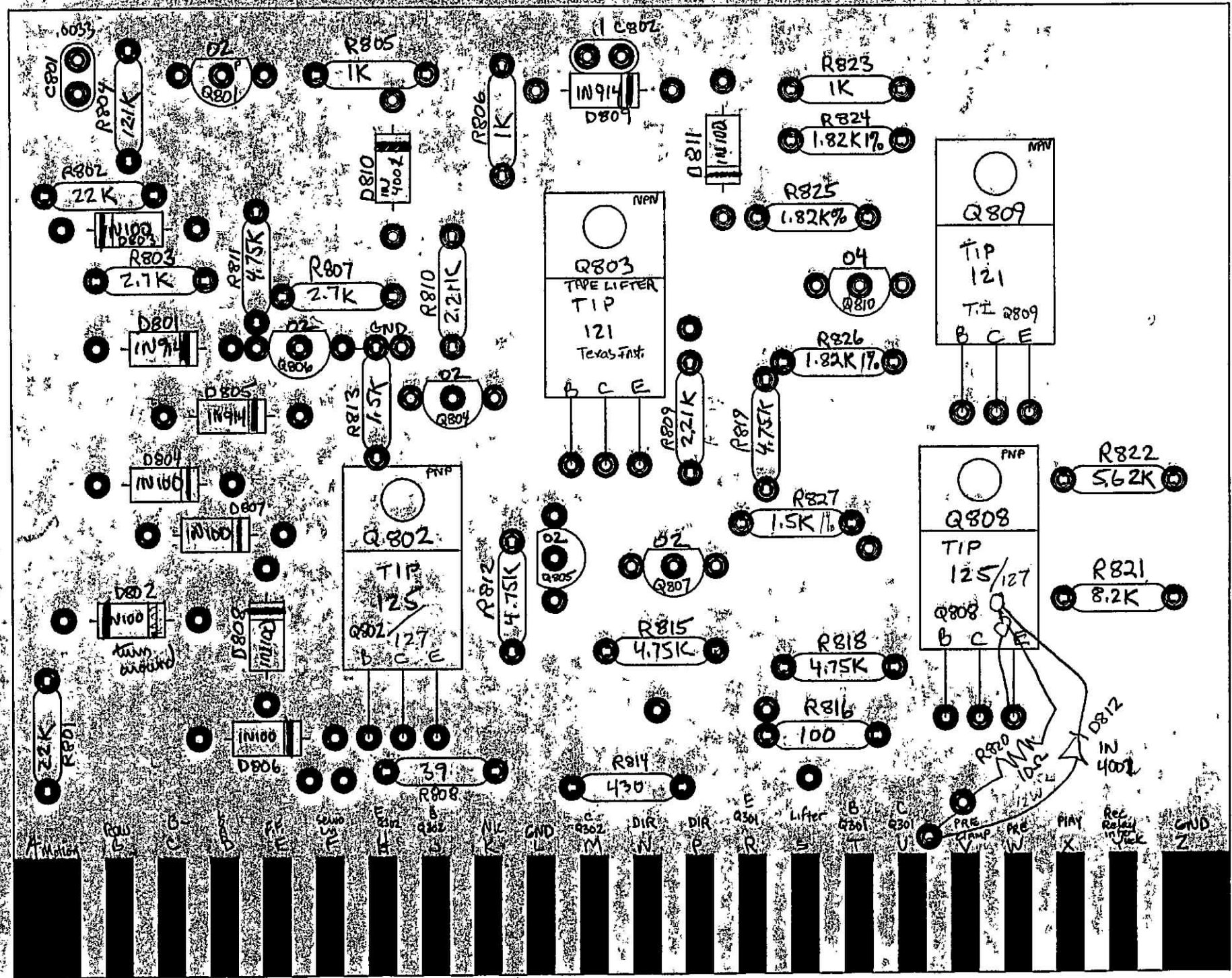
6702 PNP
3704 NPN

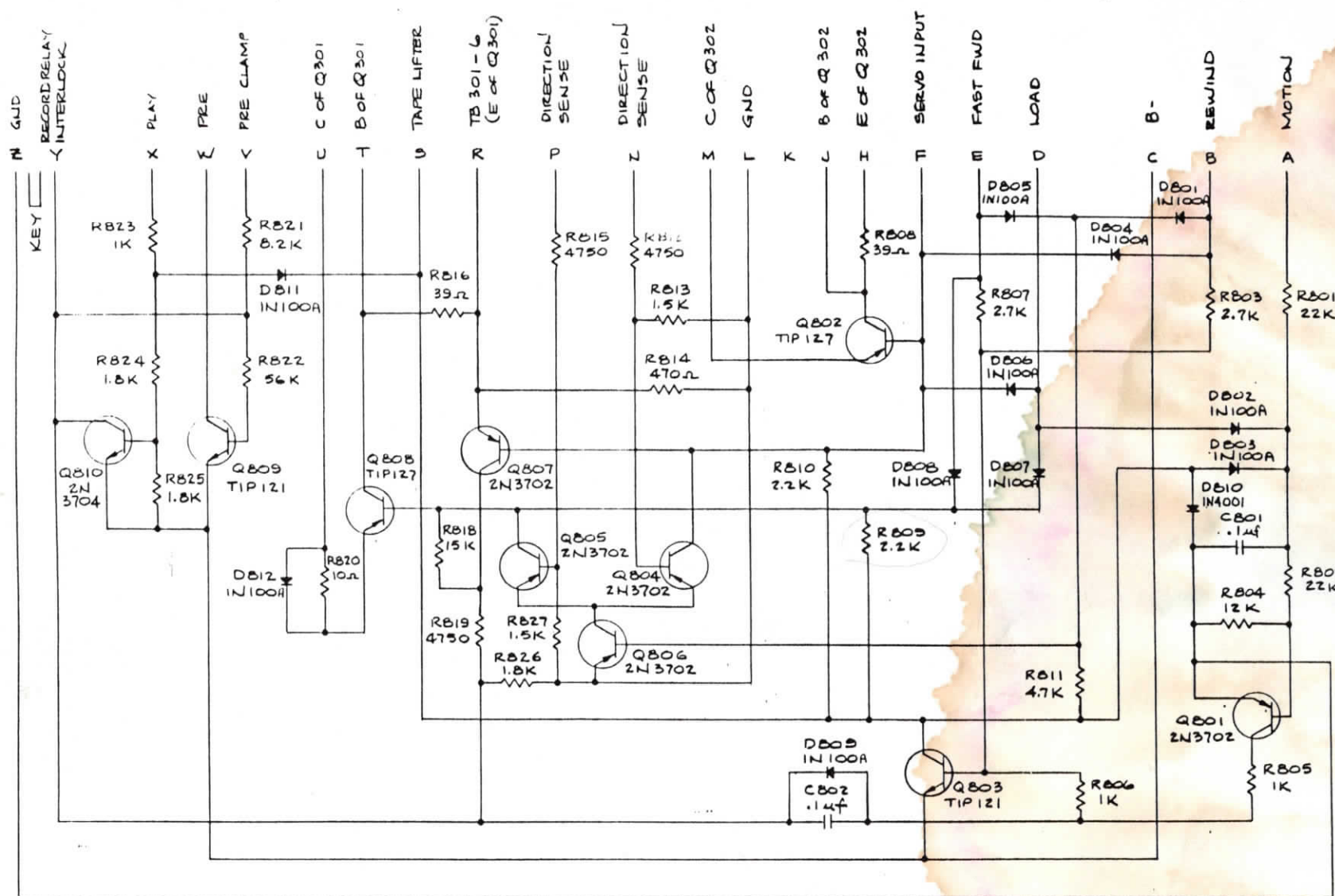
SERVO



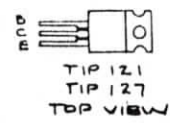
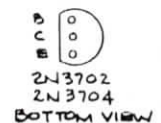
8702 PNP
5704 NPN

SERVO





ALL CAPACITORS SUPT AND IN MICROFARADS
 ALL RESISTORS 1/4 WATT



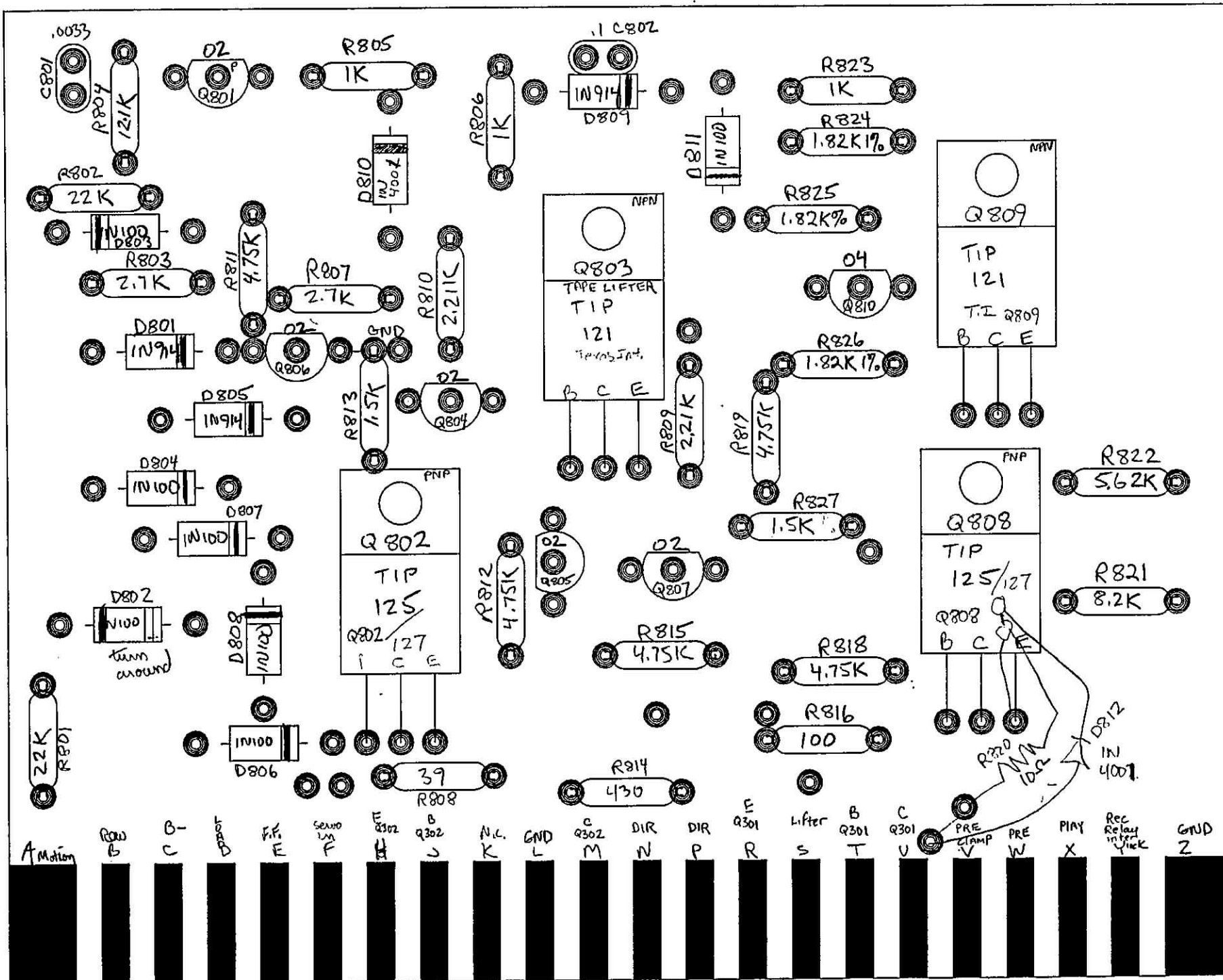
LAST SYM NO. USED	NOS. OMITTED
C 802	
D 812	
Q 810	
R 827	R 817

STEPHENS ELECTRONICS, INC.

SCALE: 1/8"	APPROVED BY: [Signature]	DRAWN BY: GIER
DATE: 3 JUL 78		REVISED
SERVO CARD - 310163A		
MODELS 103A-104A	FIGURE 6-12	DRAWING NUMBER 5C-0801A

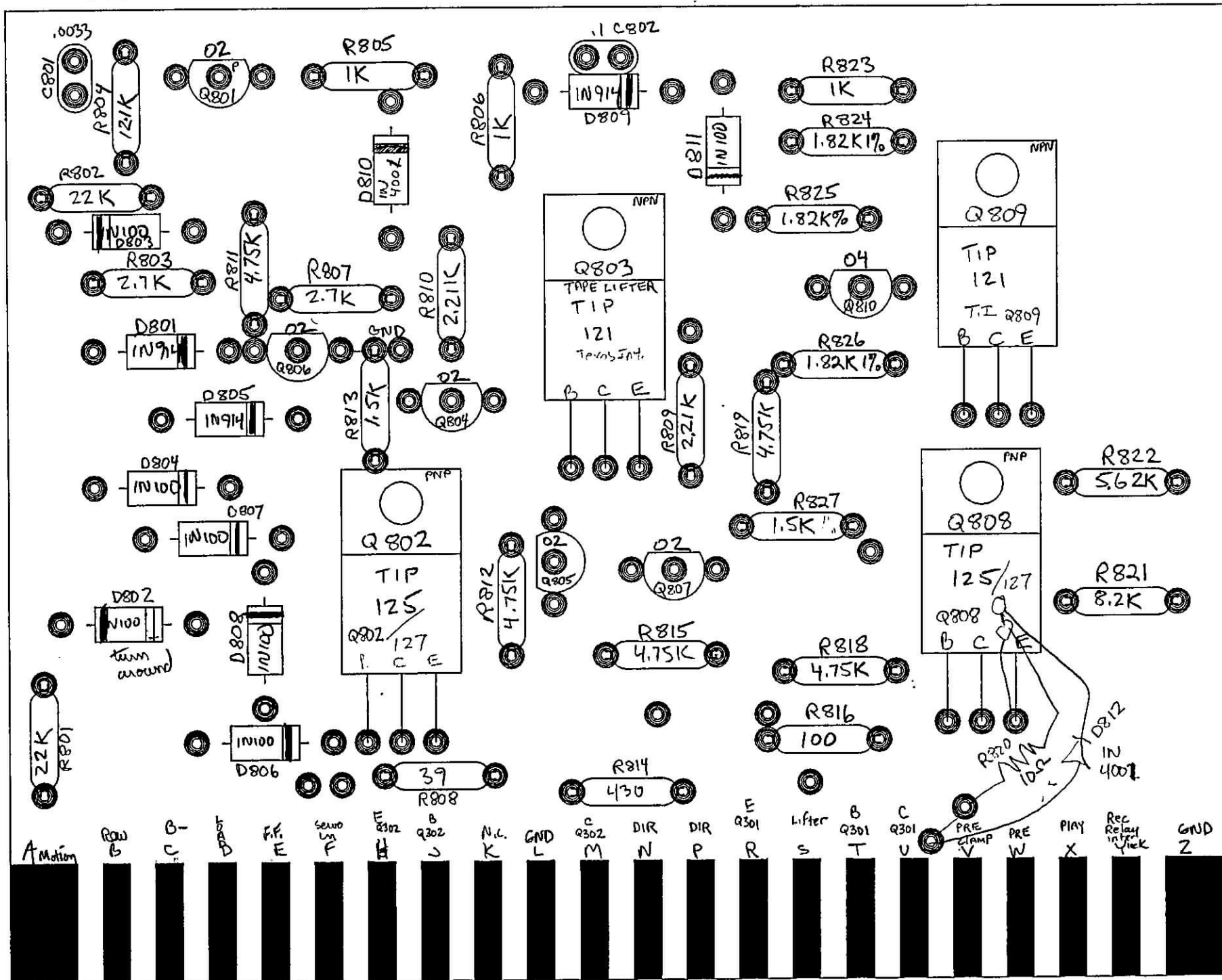
3702 - PNP
3704 - NPN

SERVO



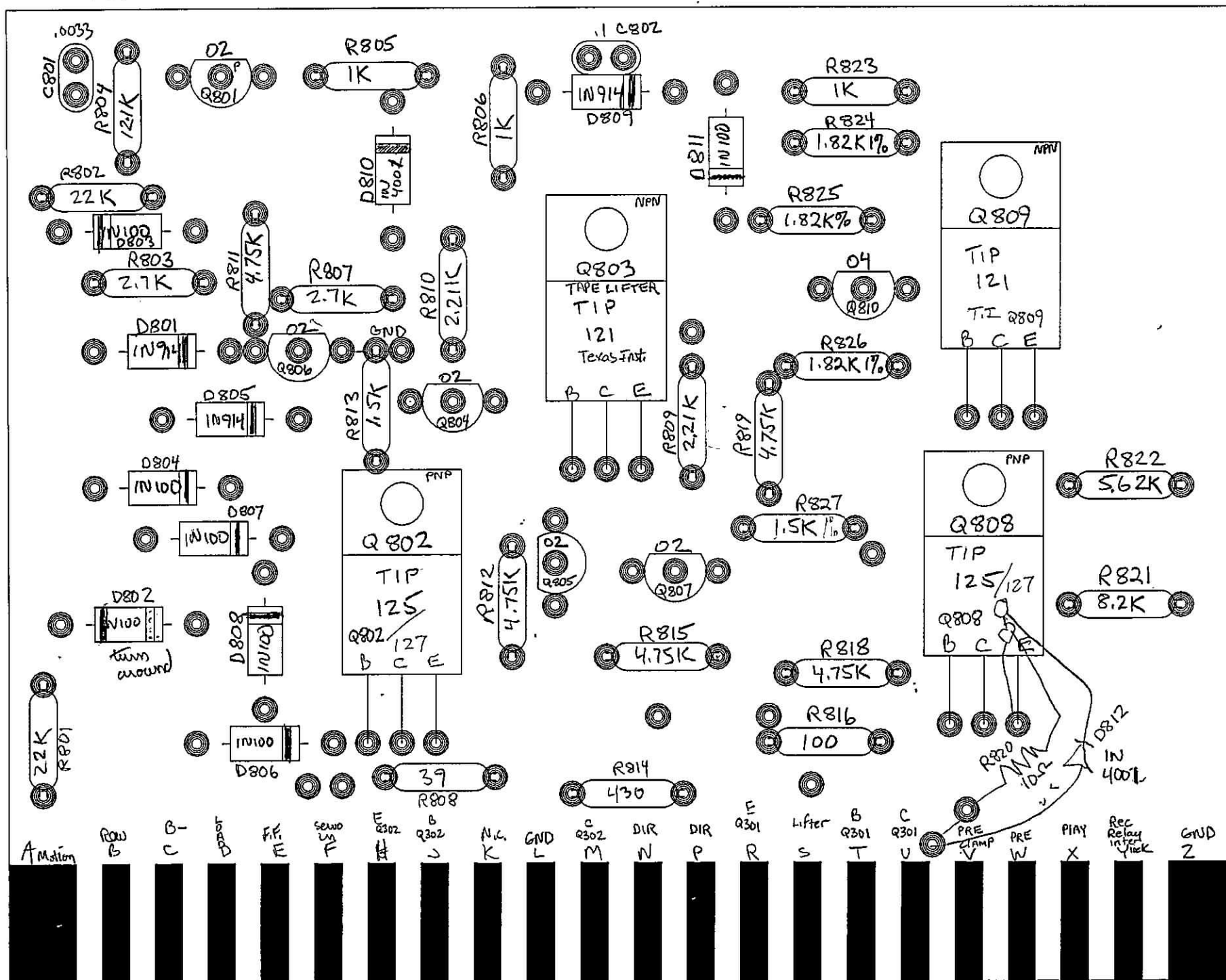
3707 - PNP
3704 - NPN

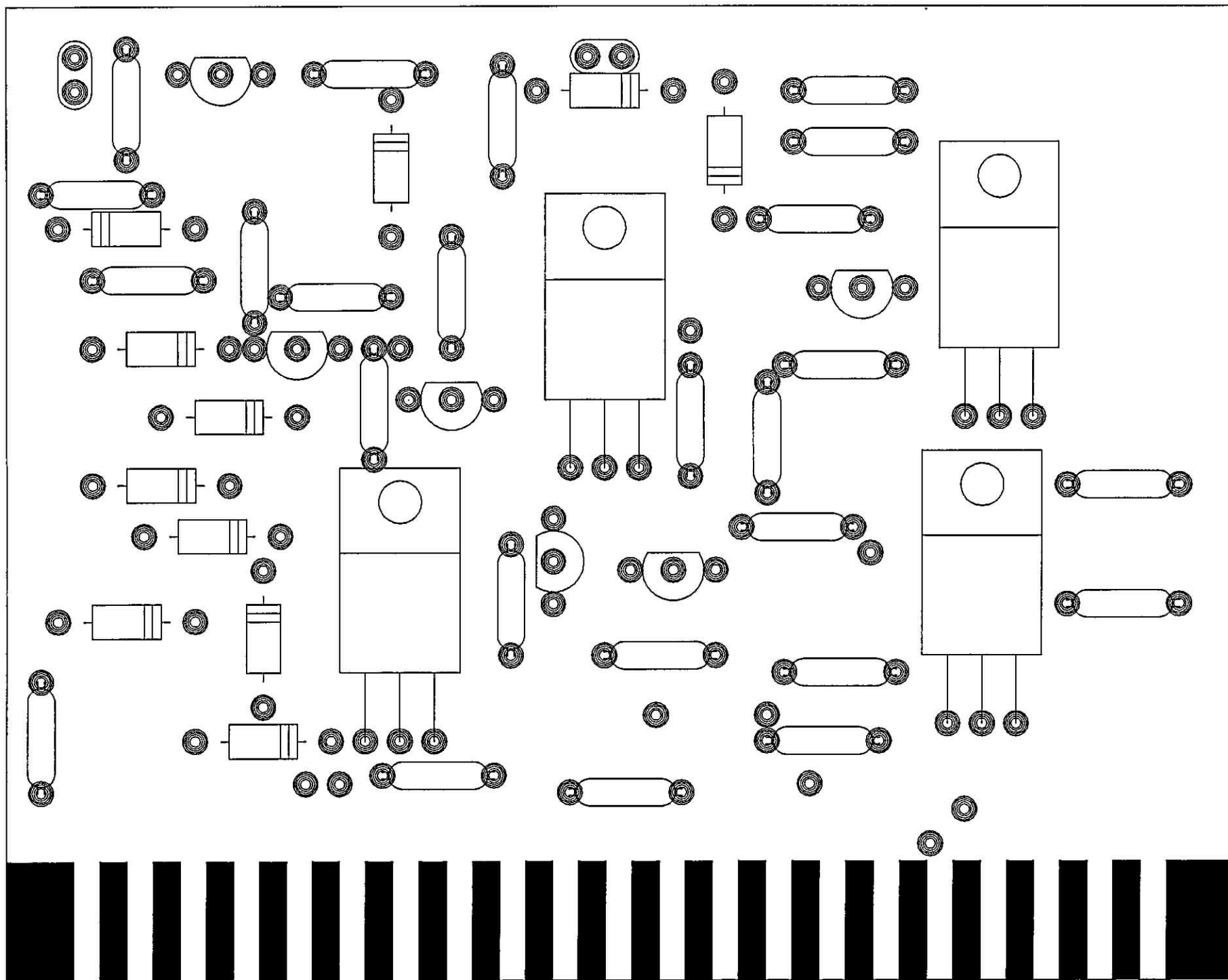
SERVO



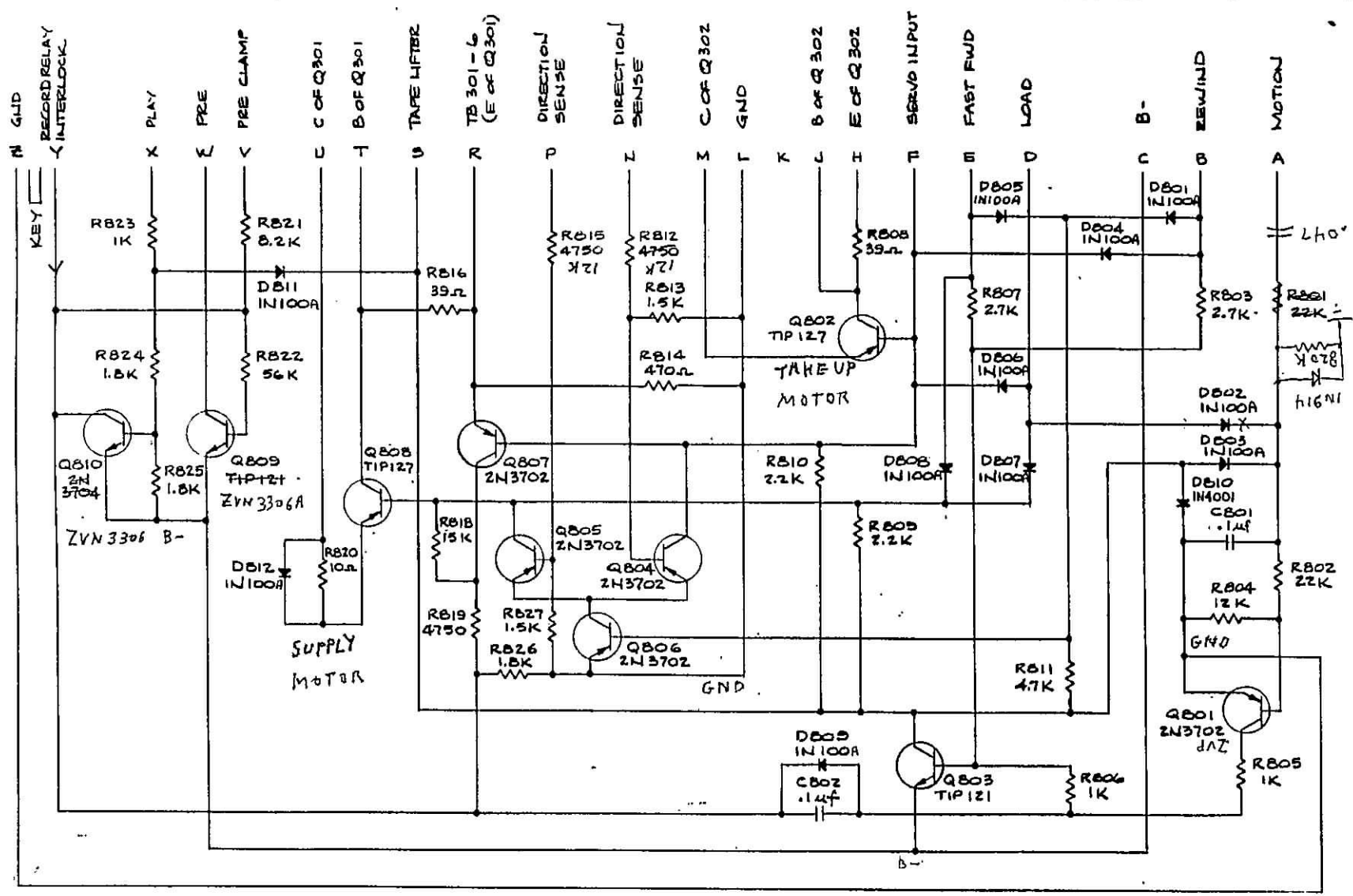
3702 - PNP
3704 - NPN

SERVO



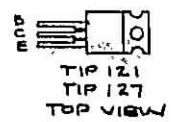
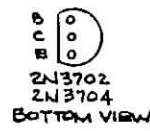


REVISIONS			
LT#	DESCRIPTION	DATE	BY
A	CB01 WAS .0033uf, MODEL WAS B214	1-25-81	B.C.104



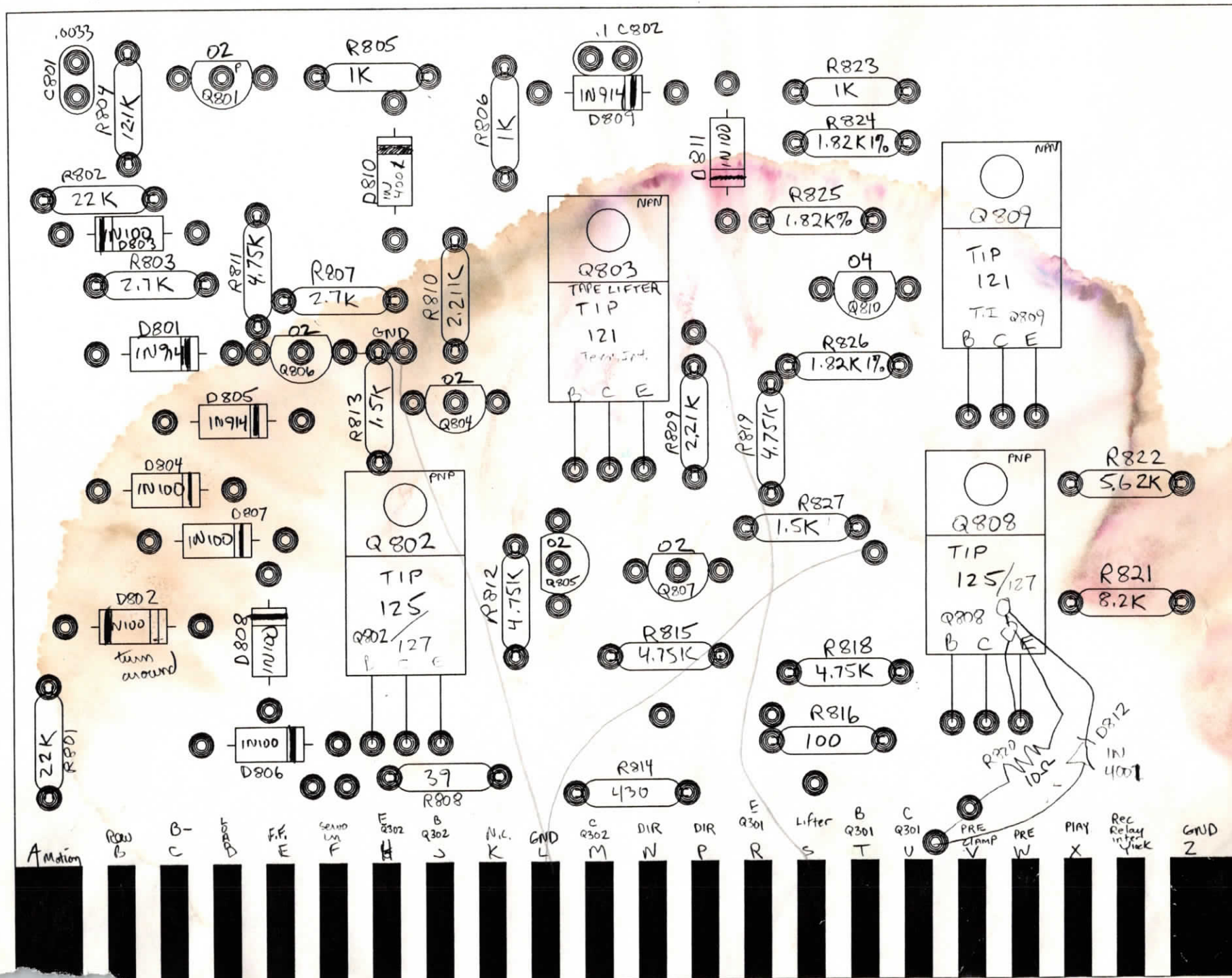
ALL CAPACITORS 50VOLT AND IN MICROFARADS
ALL RESISTORS 1/4 WATT

WAS IN NO. USED	NOS. OMITTED
CB02	
DB12	
QB10	
RB27	RB17



STEPHENS ELECTRONICS, INC.		
SCALE: 1/8"	APPROVED BY:	DRAWN BY: G.E.I.E.R.
DATE: 5 JUL 78		REVISED:
SERVO CARD - 310163 A		
MODELS 103A-104A	FIGURE 6-12	DRAWING NUMBER SC-0501A

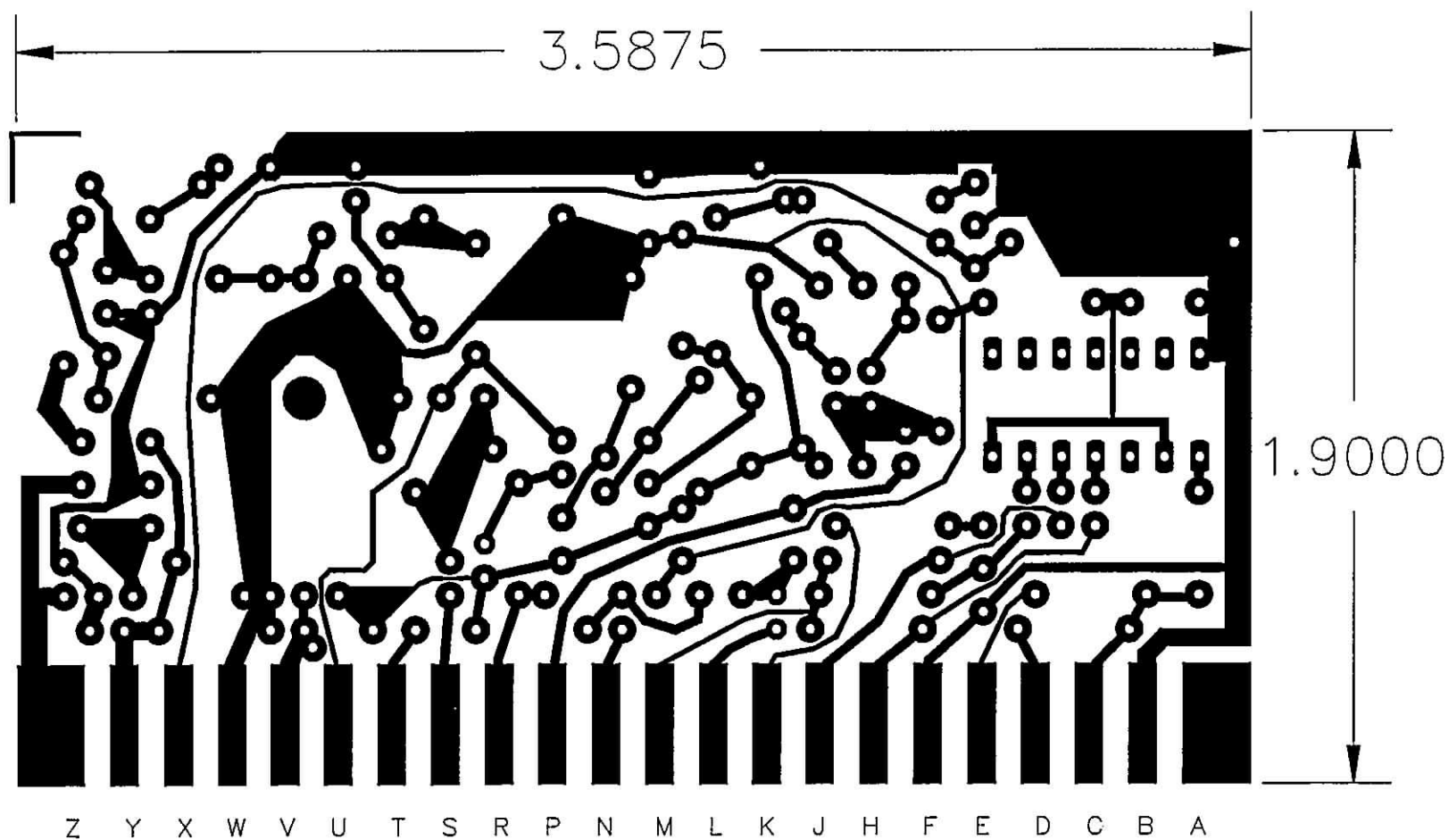
SEP 10

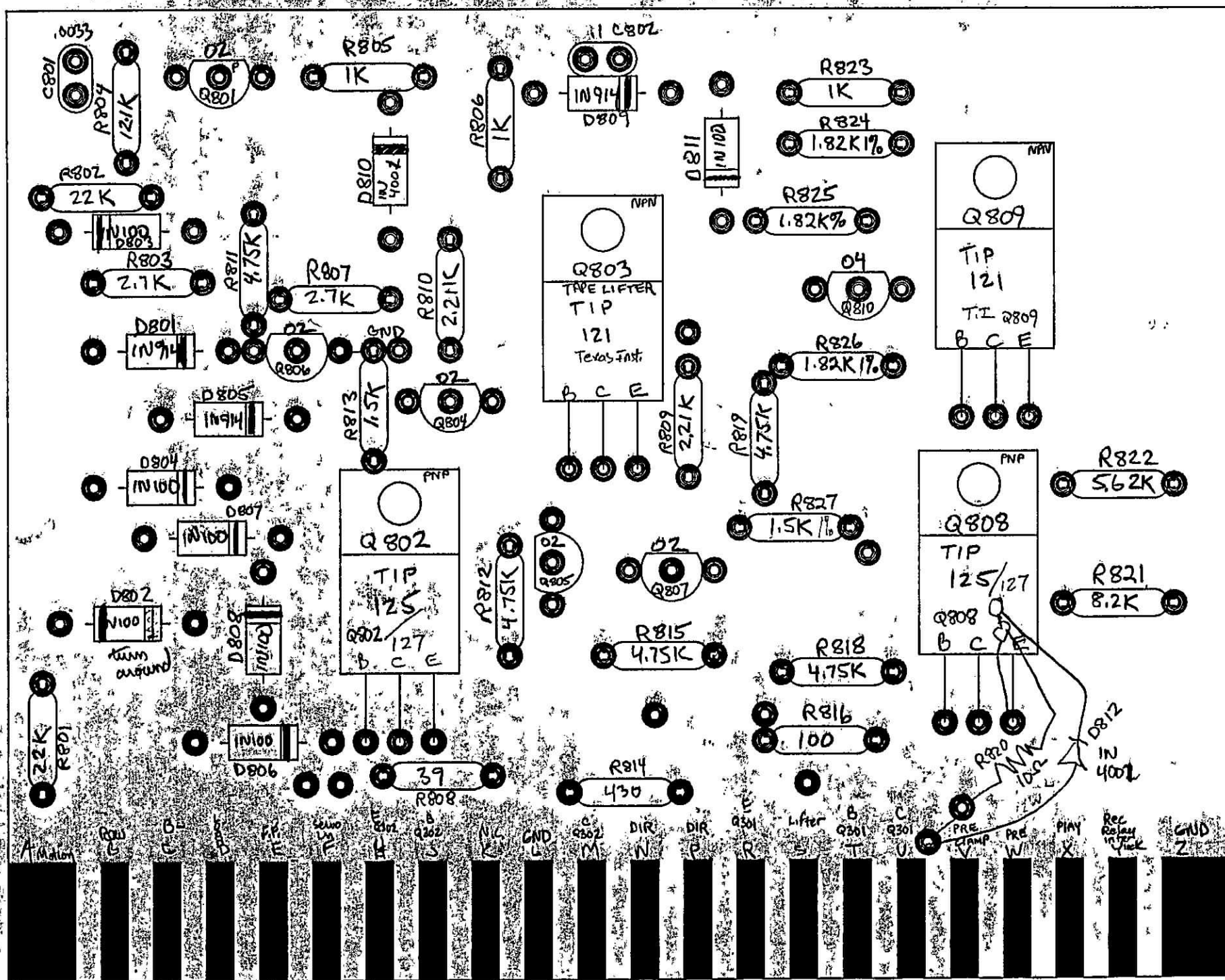


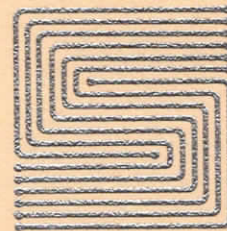


SERVO PCB
SOLDER SIDE

SOLDER SIDE







STEPHENS
ELECTRONICS, INC.
3513 PACIFIC AVENUE
BURBANK, CALIF. 91505
PHONE: (213) 842-5116

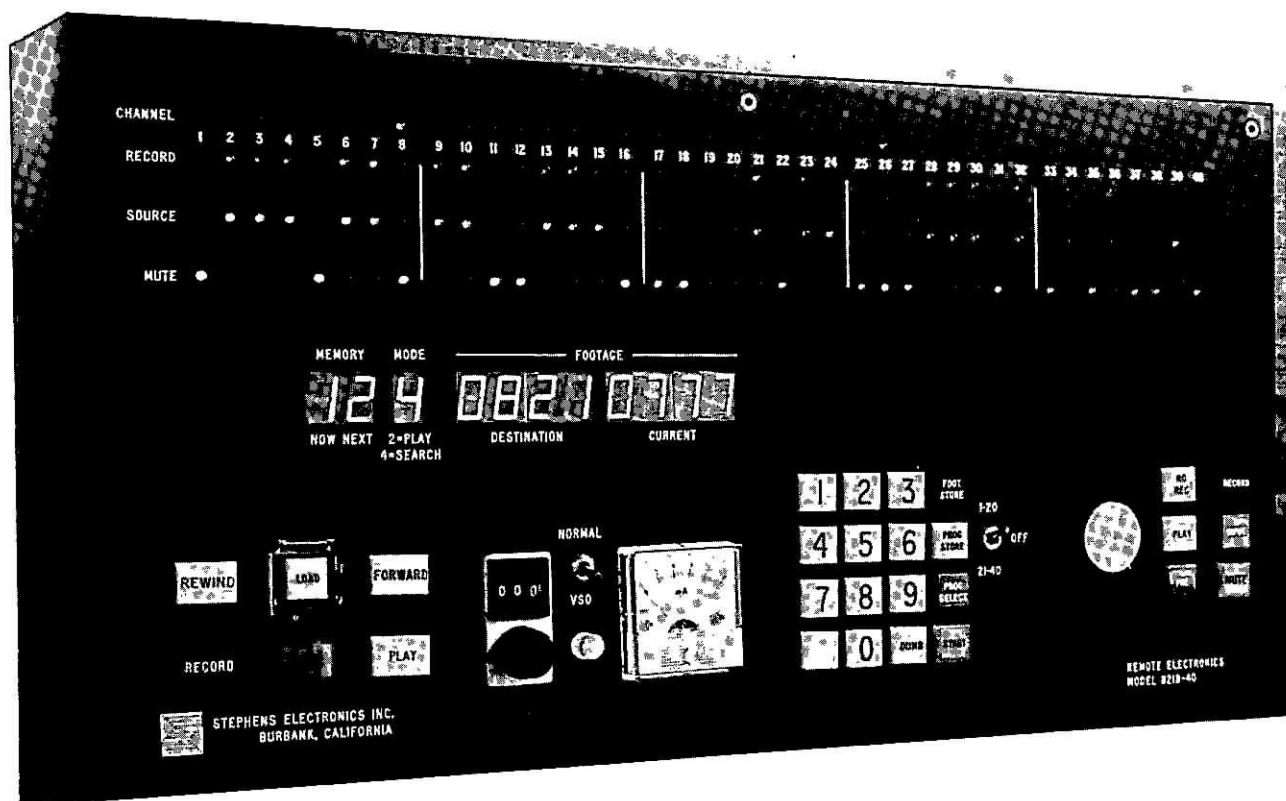
AUTOMATIC TAPE LOCATOR

Stephens Electronics, Inc., Burbank, California, proudly presents their new automatic tape locator. The microprocessor control system enables the operator to store and display ten cue locations via the high quality keyboard. Control functions consist of the following:

1. Program storage, which loads into memory the destination, as well as mode selection; stop, play or search, and also the number of the next program to be processed.
2. Footstore, which enters any desired location into the machine's current footage.
3. Program select, which will display and currently process any stored footage.
4. "Dumb", which loads the tape's current location into destination memory and returns the tape to this cue.
5. Start, which initiates auto locator control.

Therefore, the storage of mode and next program data, permits this amazing device to cycle automatically to the next program when tape footage equals the desired destination. Manual control negates start and is actuated by any of the machine's motion switches. In manual control, the locator displays tape footage and stores any cue by pressing "dumb" button. The locator has an eleven digit LED readout and is available as a hand held unit (14cm x 19.5cm), or in the complete 24-track remote electronics package (18.75cm x 36.5cm).

The Stephens Q-II Autolocator.



The inherent simplicity of the Stephens transport has enabled the design of a fully automatic tape locator. Our microprocessor controlled system permits you to store and recall up to ten commands. Instructions are entered via a high quality keyboard and controls are distinguished by illuminated buttons. Information is read from an eleven digit LED display. Maximum shuttle speed is maintained within feet of the desired location, at which time the ramp braking system takes over and stops with no overshoot.

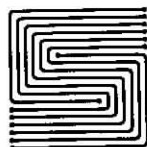
Instructions are easy to enter, simply do the following. First push the PROGRAM STORE button and enter a program number from one to nine which you have assigned to identify the instruction. Select a program number that you will use to identify the next set of instructions that you will enter—instructions do not have to be in numerical sequence. Next, select the mode you will be operating in for your instruction—push "2" for play or "4" for search. Enter a four digit footage location where the current instruction ends and the autolocator cycles automatically to the next instruction. Now push START and the locator will take control.

Manual control of your Stephens recorder/reproducer can be regained at any time by pushing

STOP or REWIND. In manual control, the locator is there to assist by displaying tape footage, and can store any cue location when the DUMB button is pressed. The DUMB button stores that footage count in memory, and it can be recalled at any time simply by pressing the PROGRAM SELECT button and entering a zero. This is most convenient for marking a spot that you want to work on later.

Our microprocessor based system can cycle thru ten separate commands in whatever order is desired, or as few as two commands over and over again. The advantages are obvious.

The Stephens Q-II autolocator comes standard with 15 feet of cable. It is available as a separate unit, or incorporated with deck-shuttle controls, or with the complete remote electronics package seen pictured above. For convenience multiple displays may be ordered.

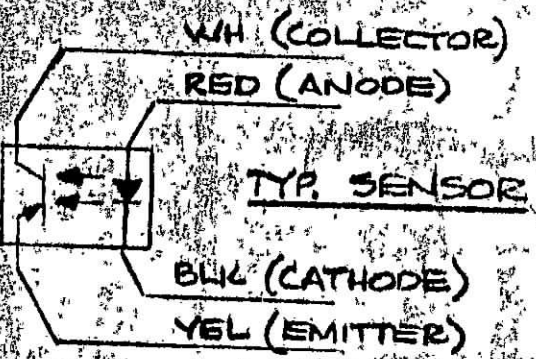
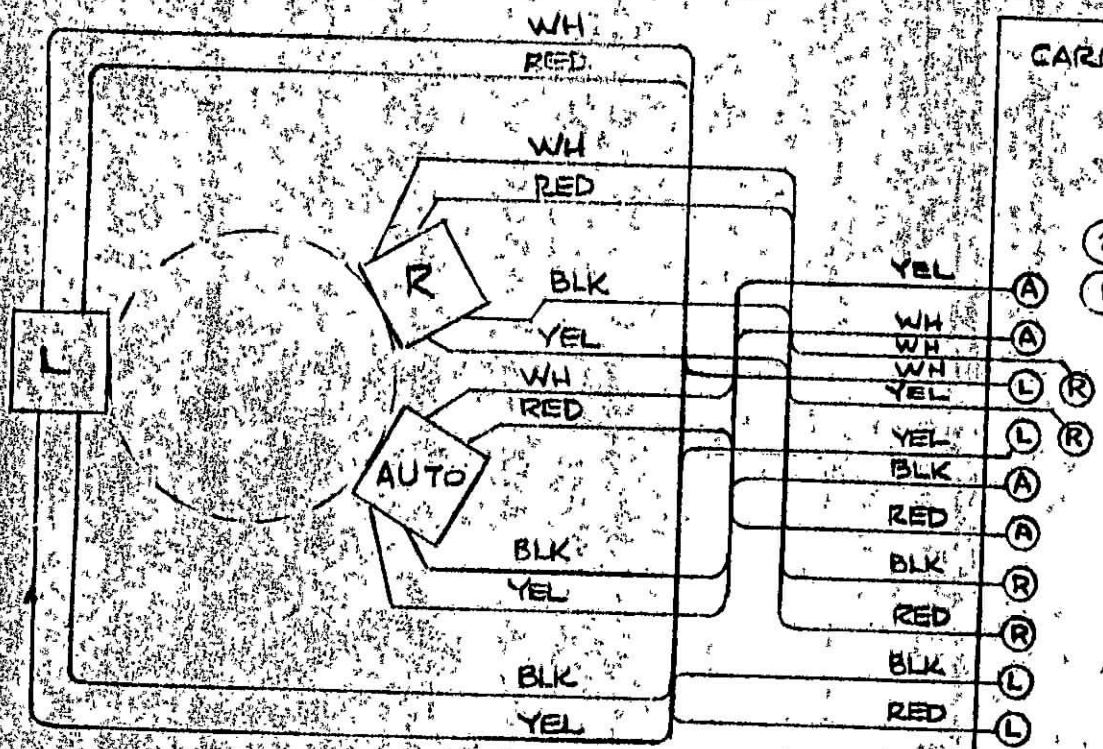


**STEPHENS
ELECTRONICS, INC**

Since 1956

3513 Pacific Avenue, Burbank, Calif. 91505 • Phone (213) 842-5116

SEE SCHEMATIC

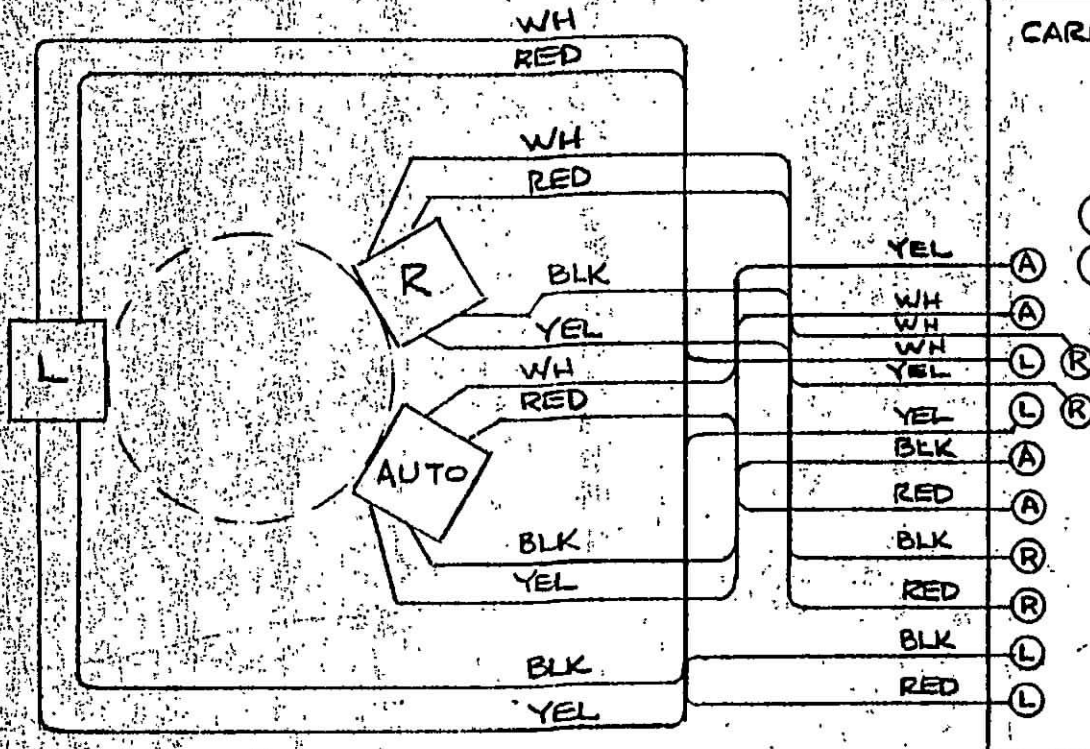


STEPHENS ELECTRONICS, INC.			
SCALE:	APPROVED BY: _____		DRAWN BY: GIER
DATE: _____			REVISED: _____
INTERCONNECTION DIAGRAM SENSOR INTERFACE			
MODEL 821 B-24-QII			DRAWING NUMBER: _____

SEE SCHEMATIC

CARD C10195-2

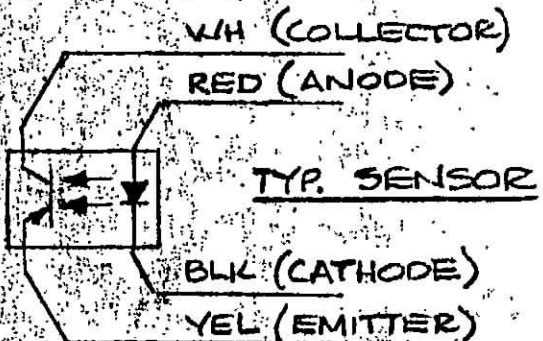
CARD C10195-1



2 4 6
1 3 5

2 4 6
1 3 5

P1 P2 P3 P4 P5 P6
25JF-B BLK 25JG-P WH/YEL 25JG-N WH/BLU 25JQ-35 WH/GRN 25JF-C BLU 25JF-W BRN



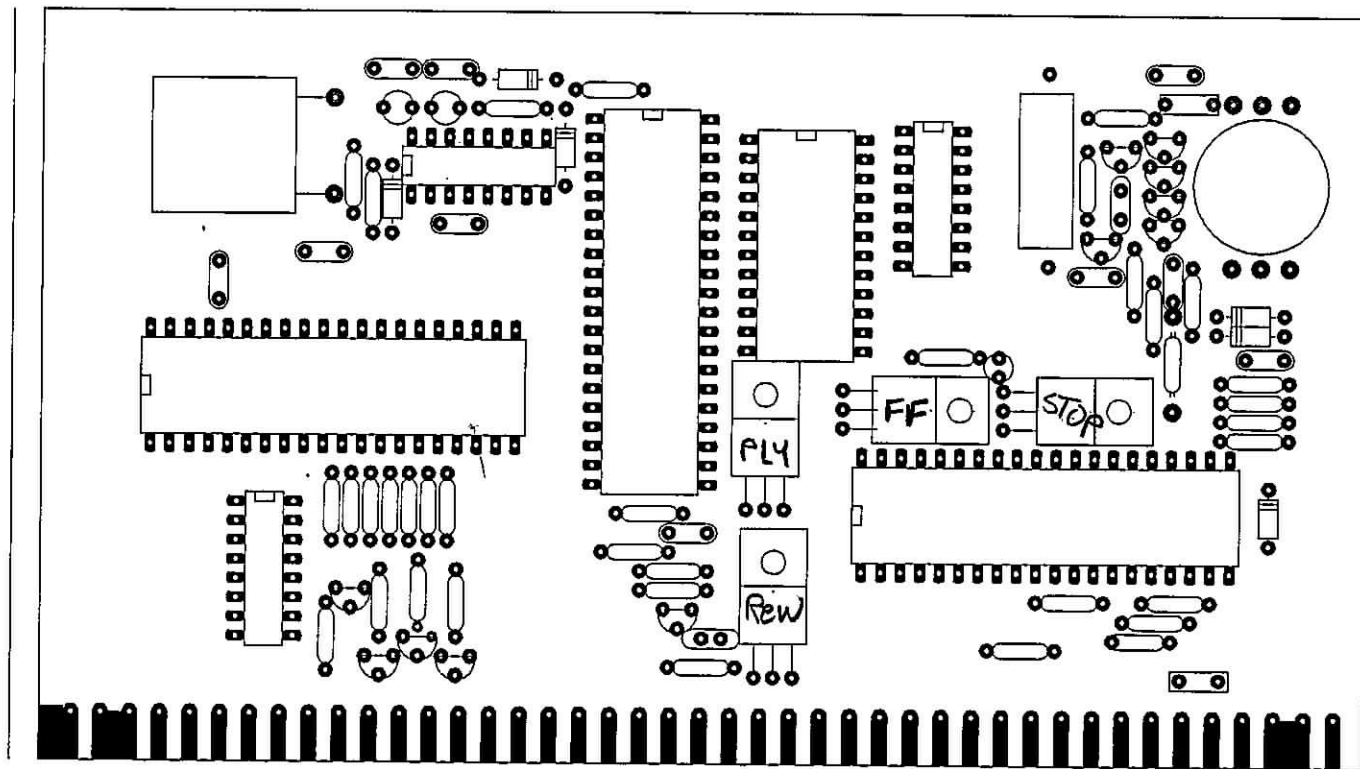
STEPHENS ELECTRONICS, INC.

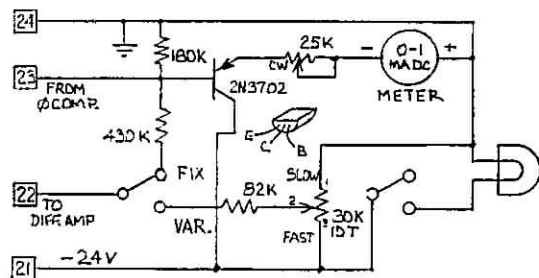
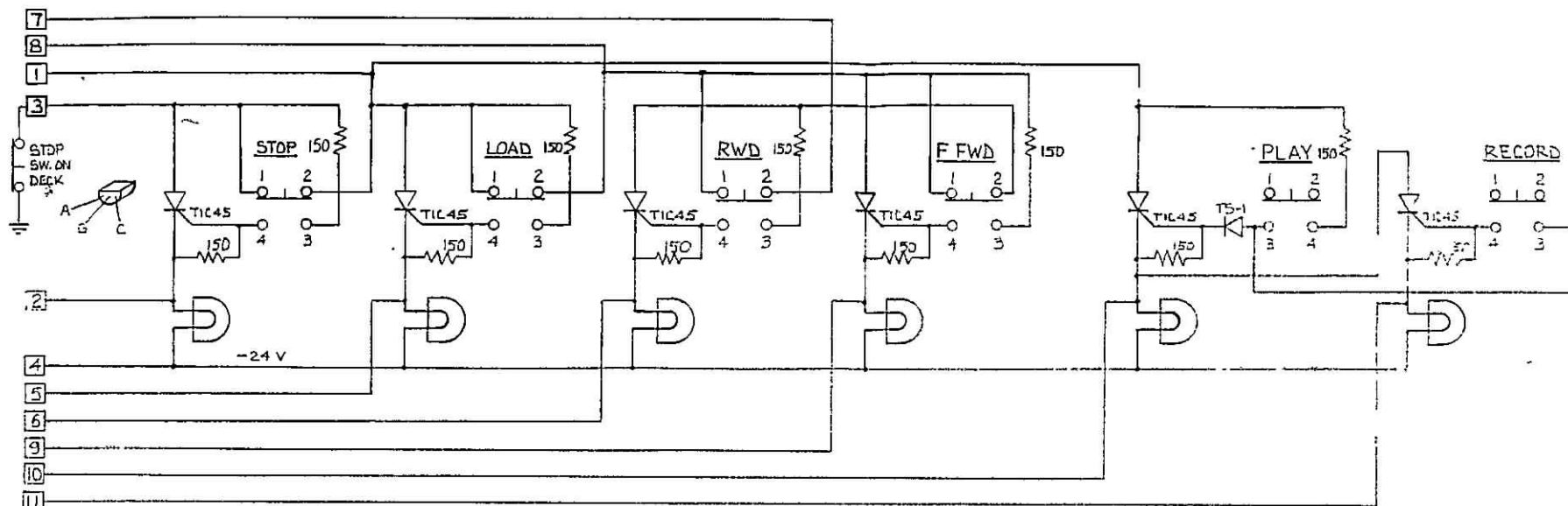
SCALE: APPROVED BY: DRAWN BY: GEIER
DATE: REVISED

INTERCONNECTION DIAGRAM
SENSOR INTERFACE

MODEL 821 B-24-QII

DRAWING NUMBER





27 TACH PULSES FROM COUNTER

29 TO ϕ COMP.

31 FROM TIME BASE SOURCE

32 TO ϕ COMP. REF IN

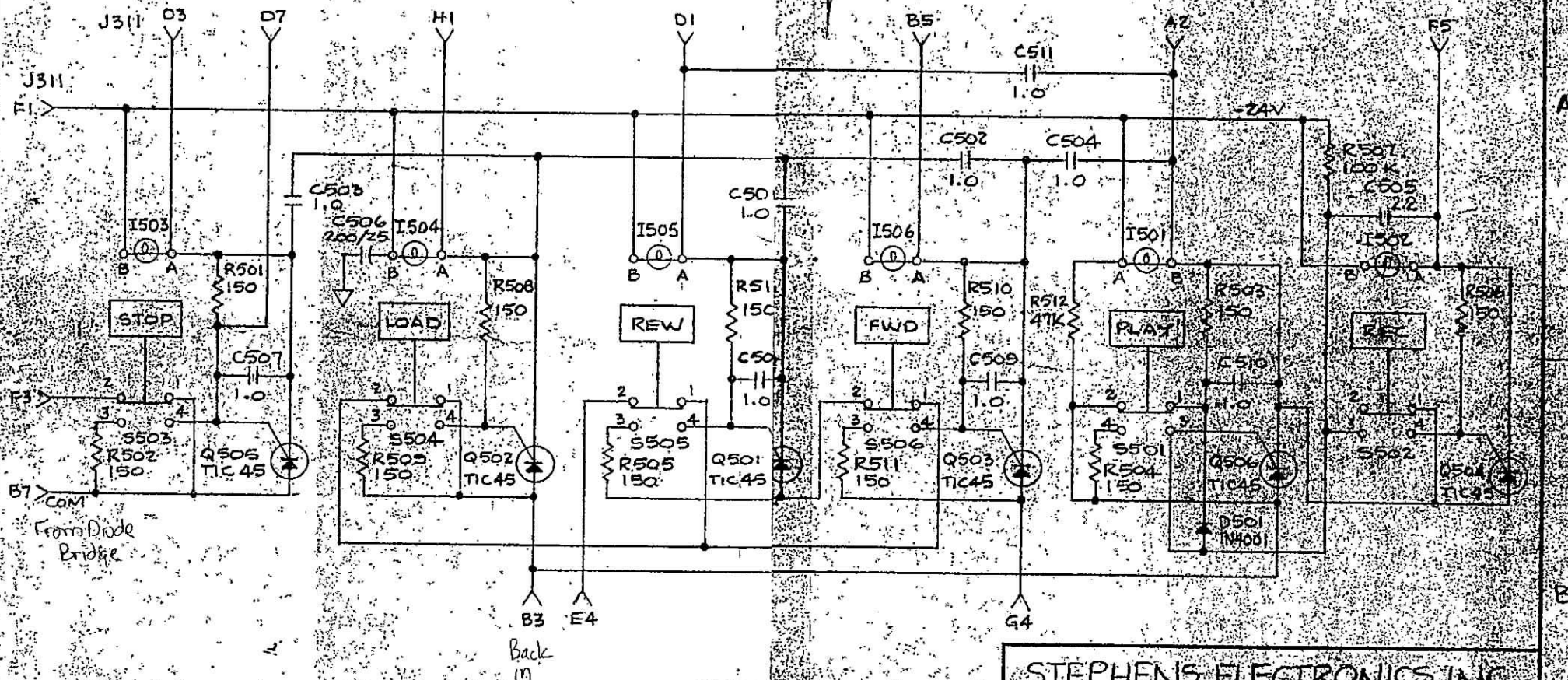
"PRELIMINARY"

31 MAY '83

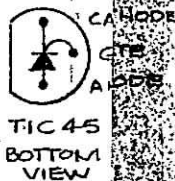
STEPHENS REMOTE TRANSPORT CONT'L. SCHEMATIC

ALL RESISTORS 1/4 WATT
ALL CAPACITORS 50VOLT AND IN MICROFARRADS

REVISIONS			
LTR	DESCRIPTION	DATE	BY



LAST SYM. NO. USED	NO. OMITTED
C511	
D501	
Q506	
R513	

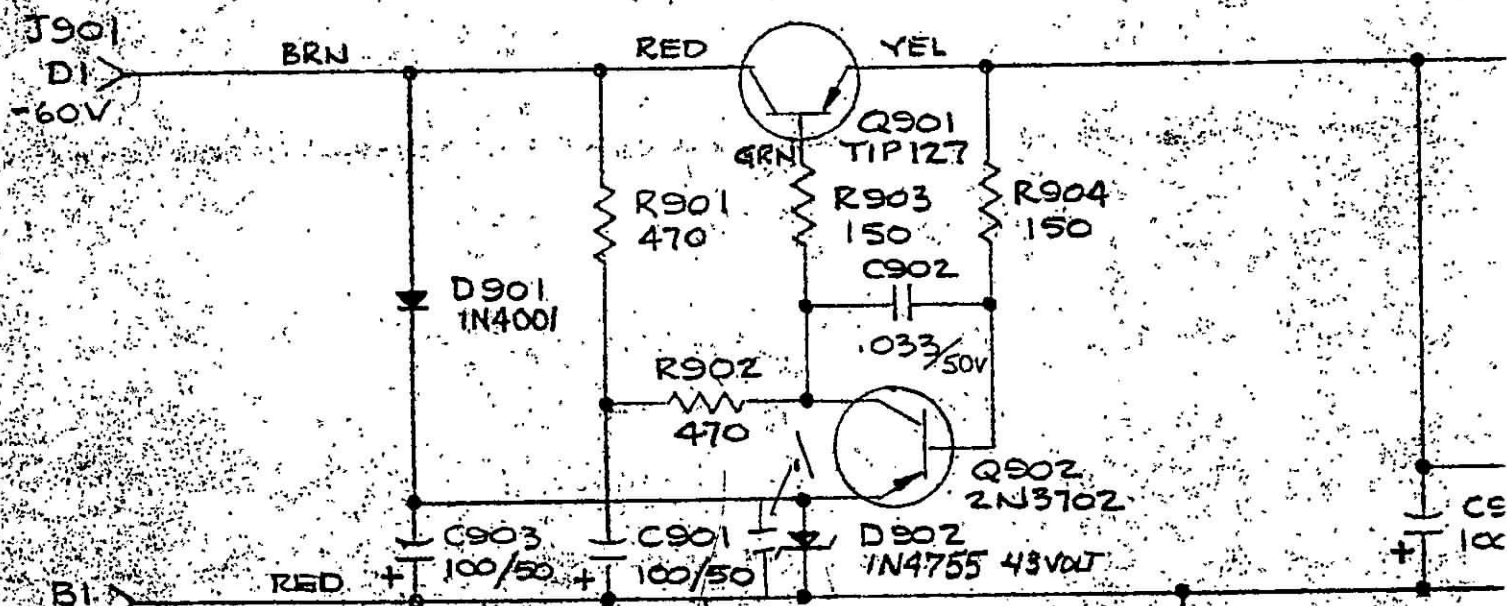


STEPHENS ELECTRONICS, INC.

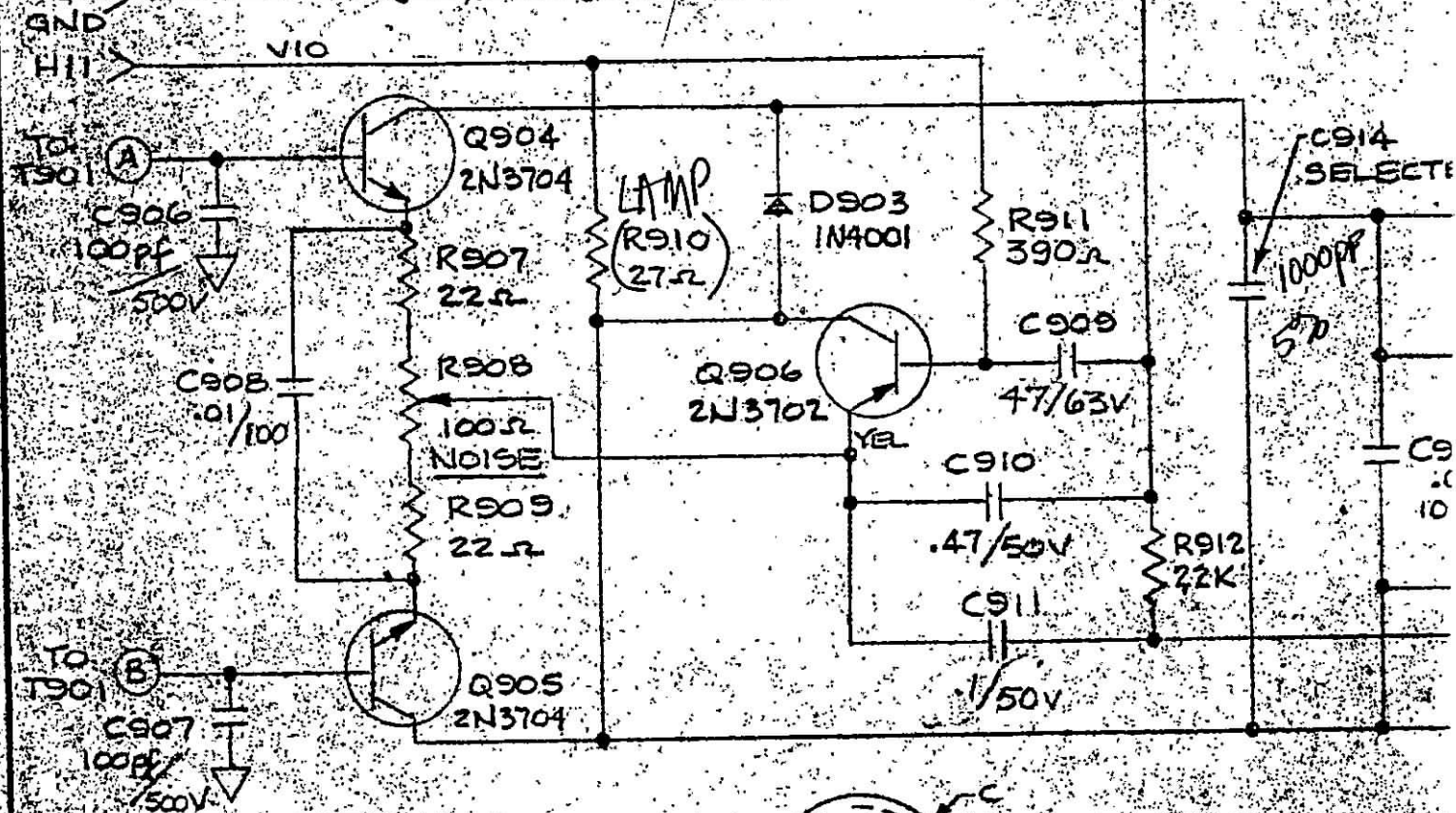
SCALE: 1/8"	APPROVED BY:	DRAWN BY: GEF
DATE: 28 SEP 79		REVISED:
DYNAMIC CONTROLS MODULE		
MODEL: 1058 1049	FIGURE 6-19	DRAWING NUMBER: SC-0501

ALL RESISTORS 1/4 WATT
ALL CAPACITORS IN MICROFARADS
UNLESS OTHERWISE NOTED

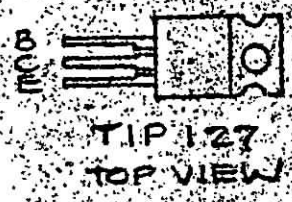
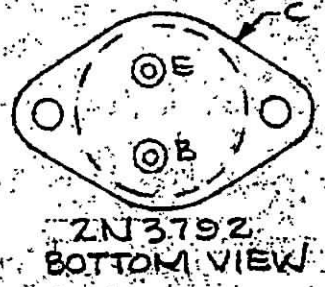
A

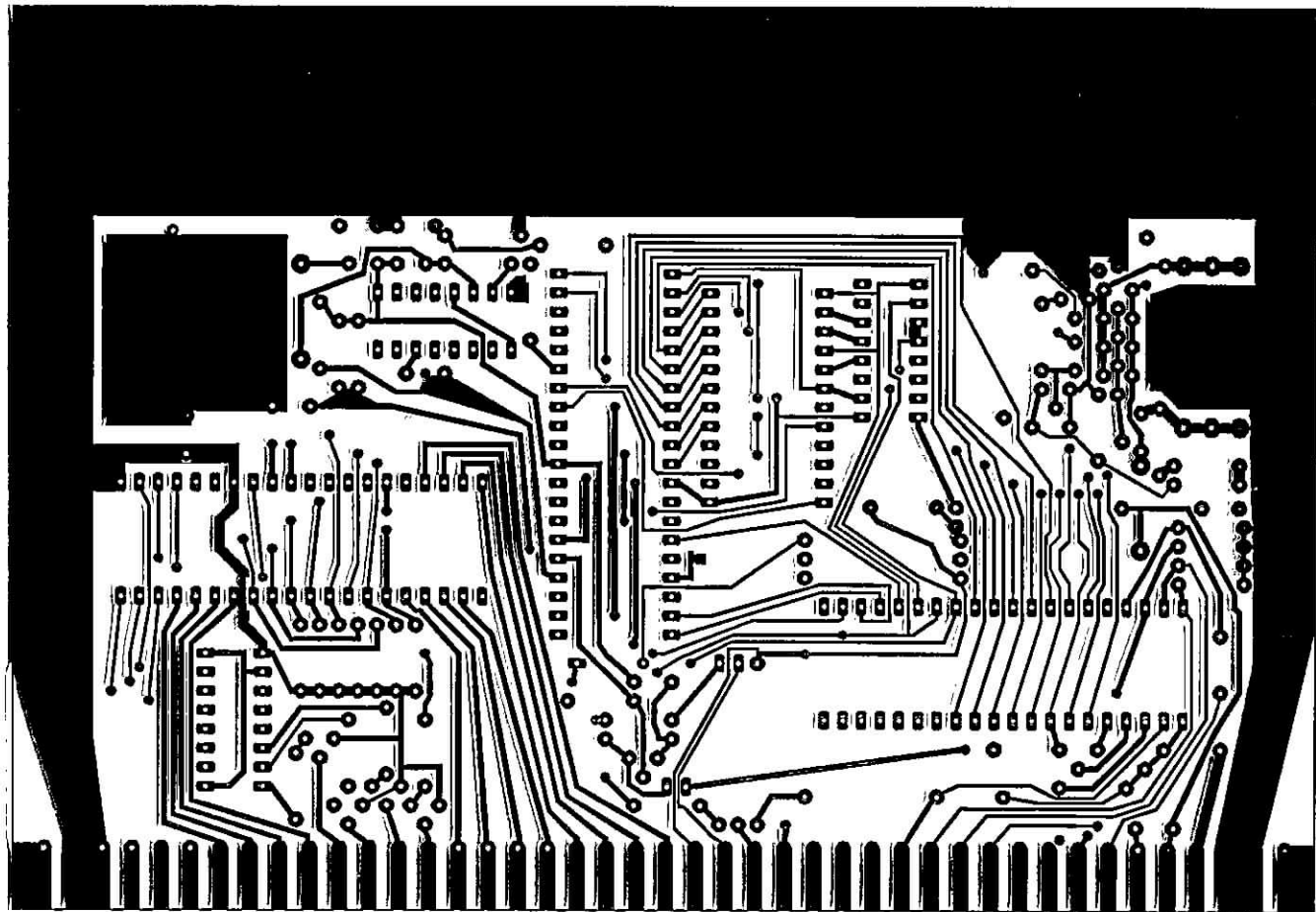


B

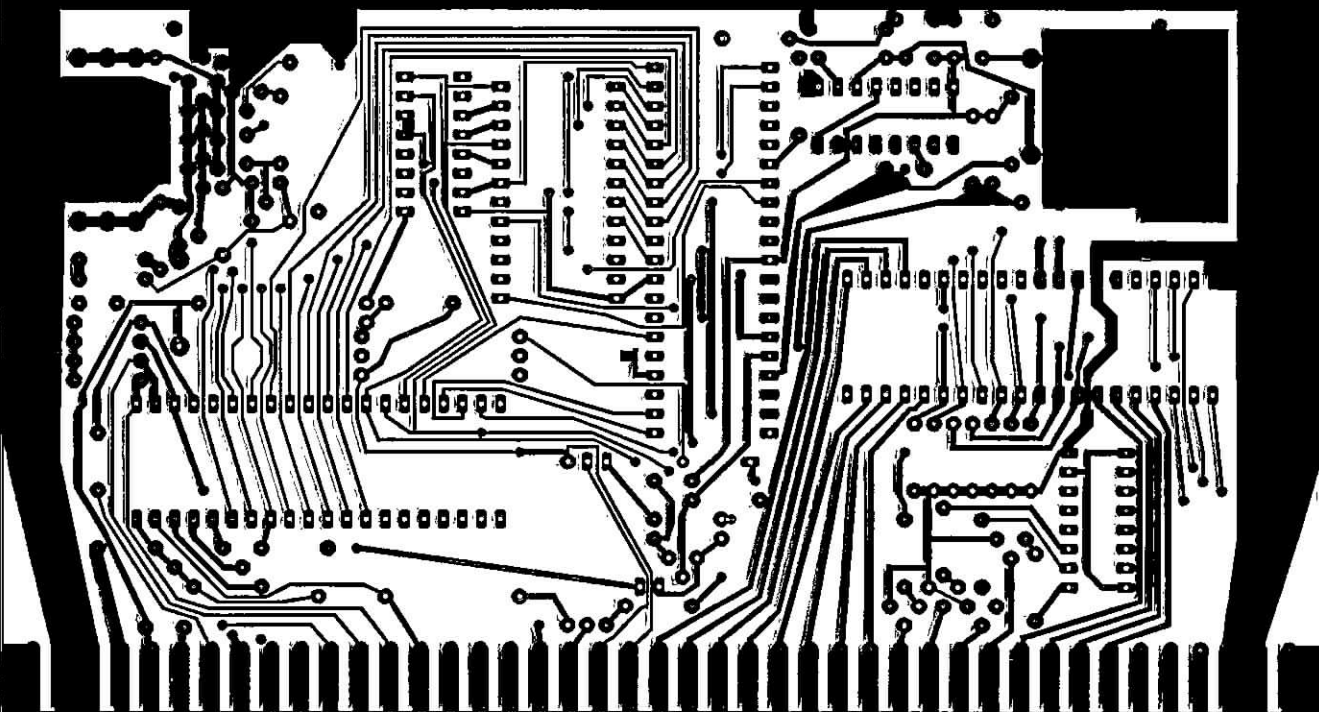


LAST SYM NO. USED	NO. O MITTED
C 914	
D 903	
Q 908	
R 916	R913, R914

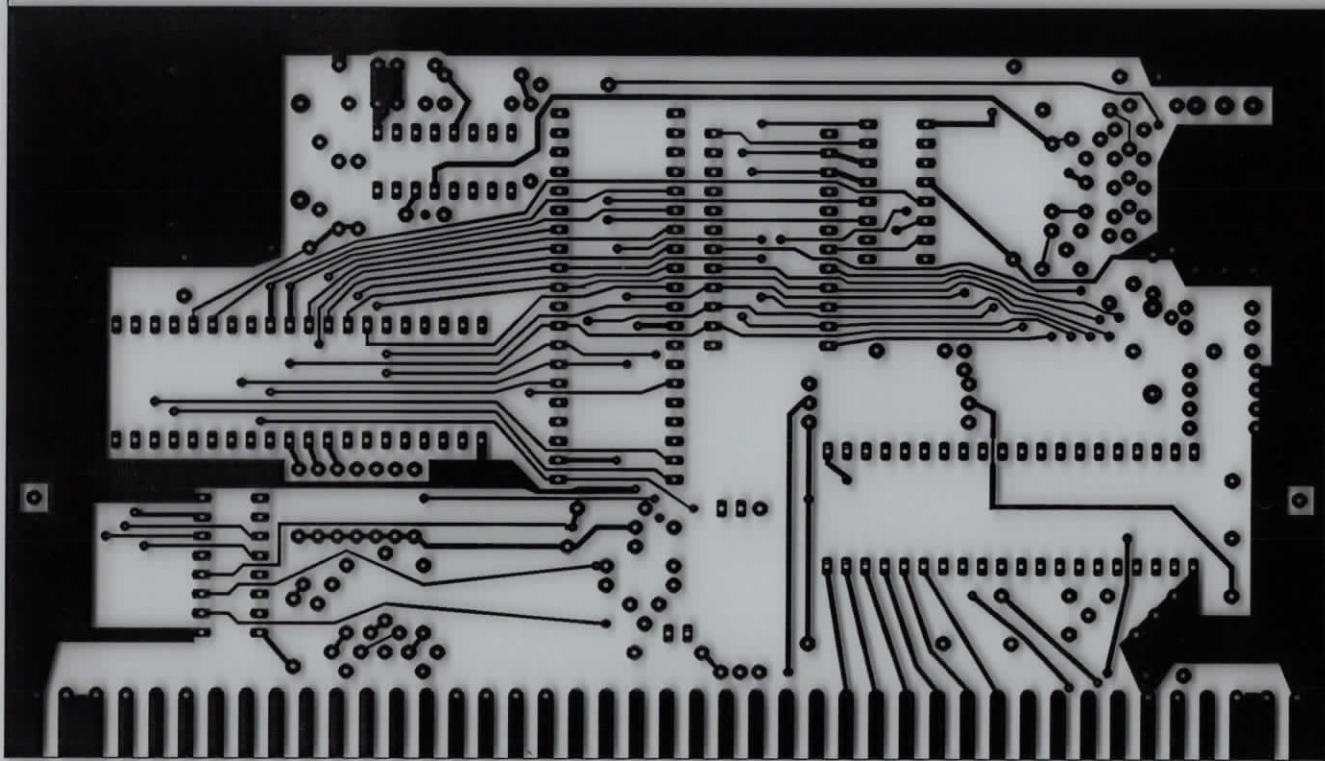




SOLDER
SIDE

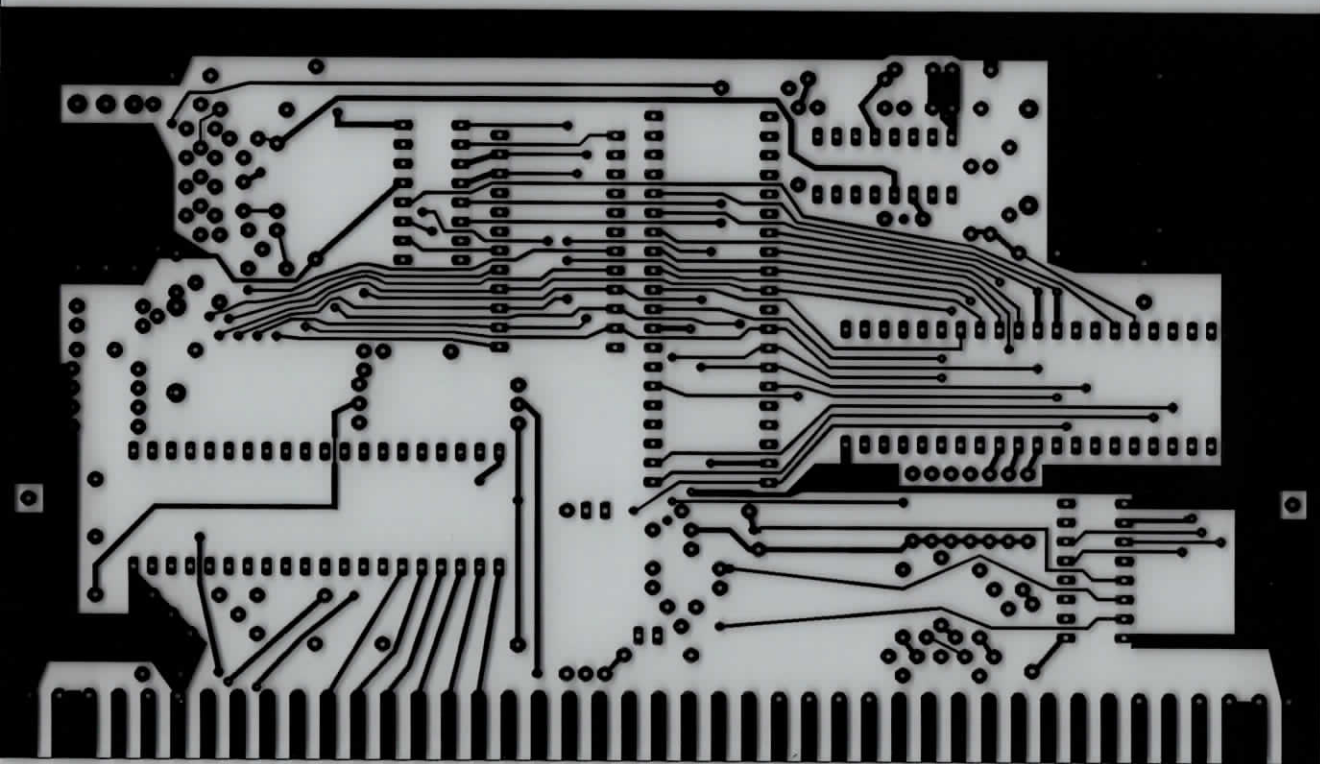


TYPE
BOARD



COMPONENT
SIDE

SOLDER
SIDE



COMPONENT

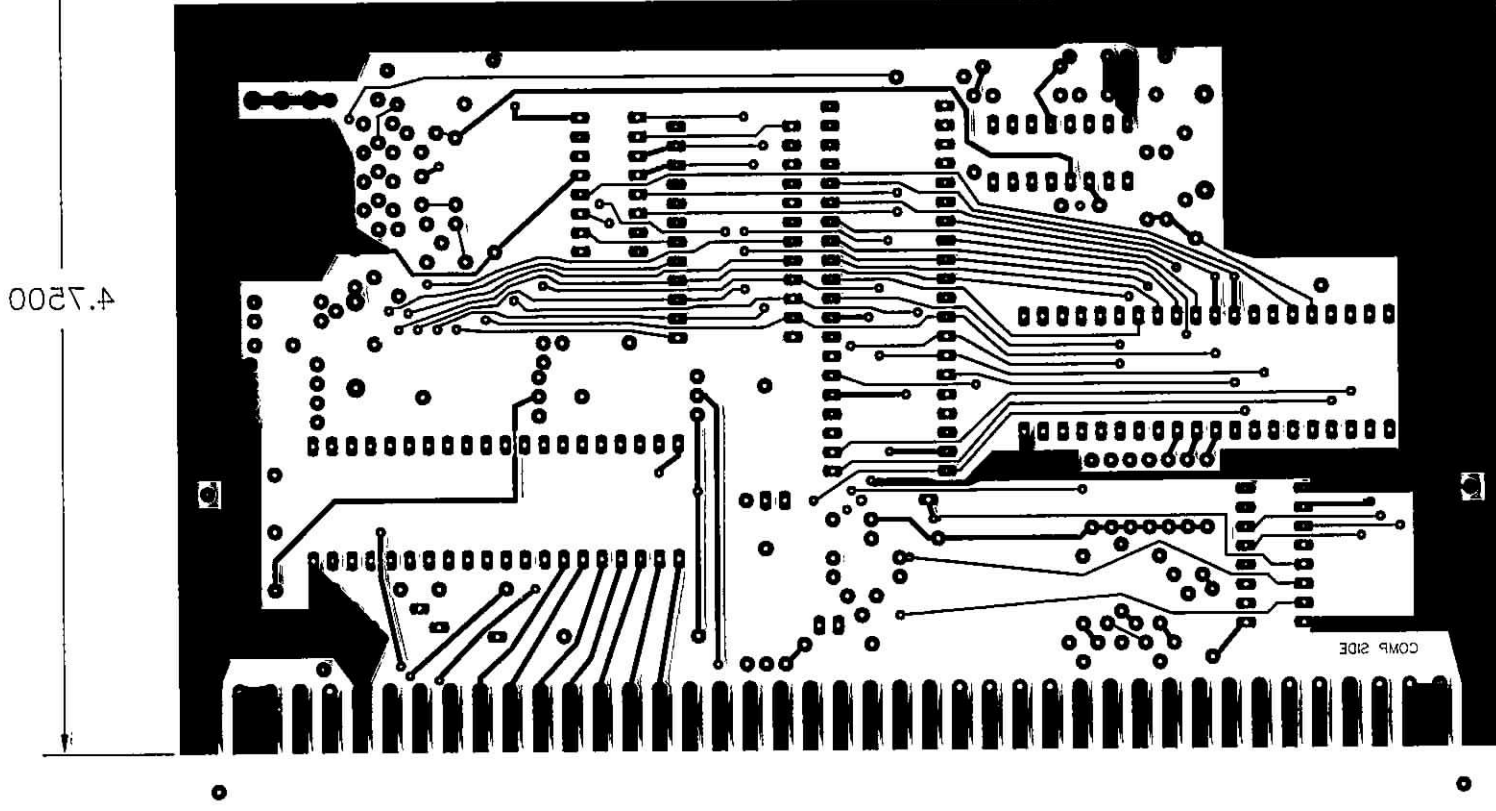
2112

SOLDER

2112

W 15049

COMP SIDE VIEWED FROM TOP



8.8750

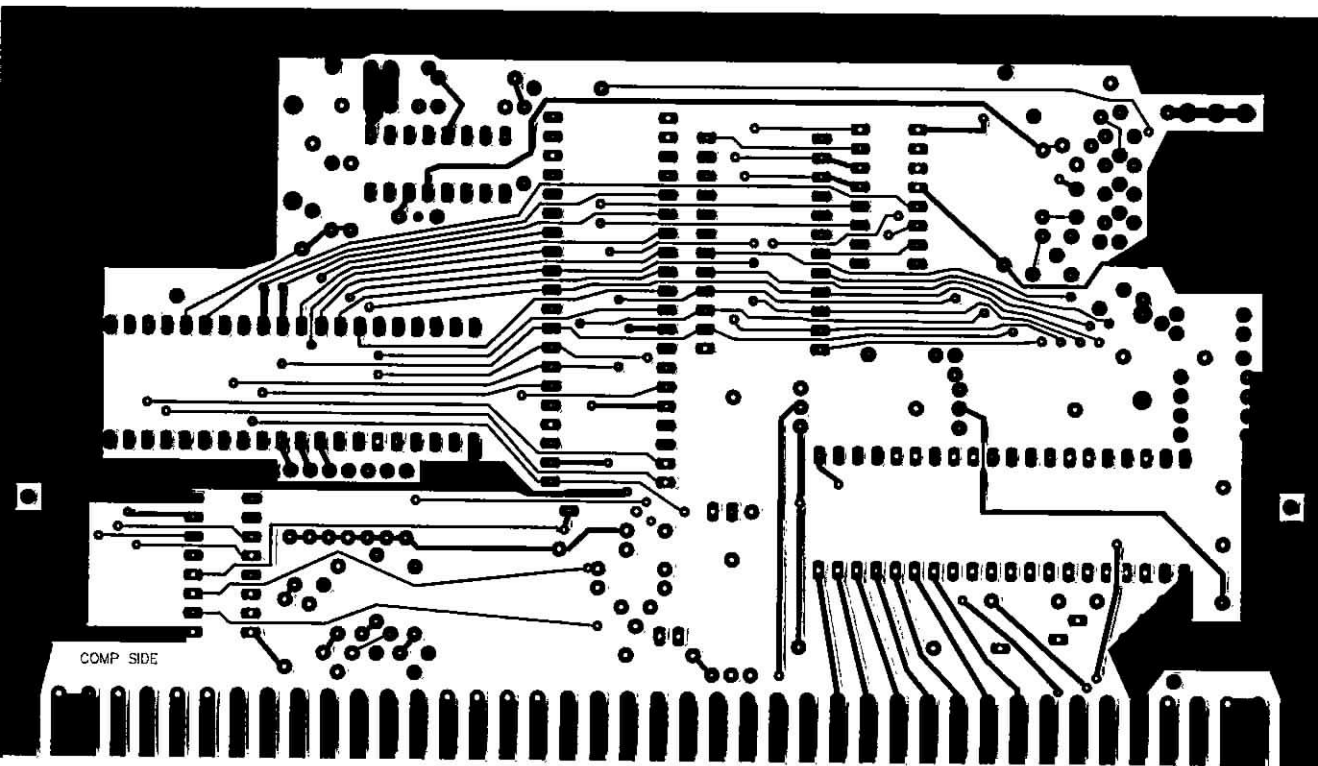
6.8750

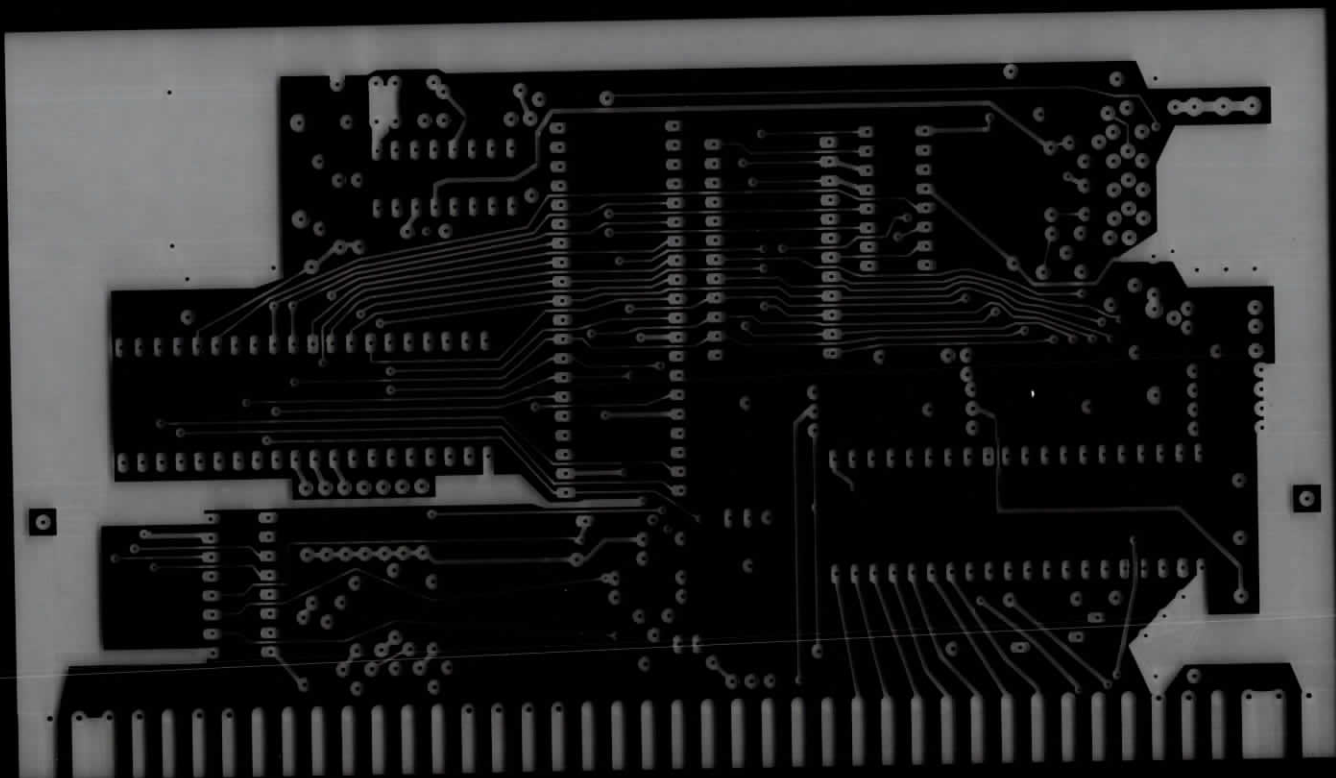
4.7500

COMP SIDE

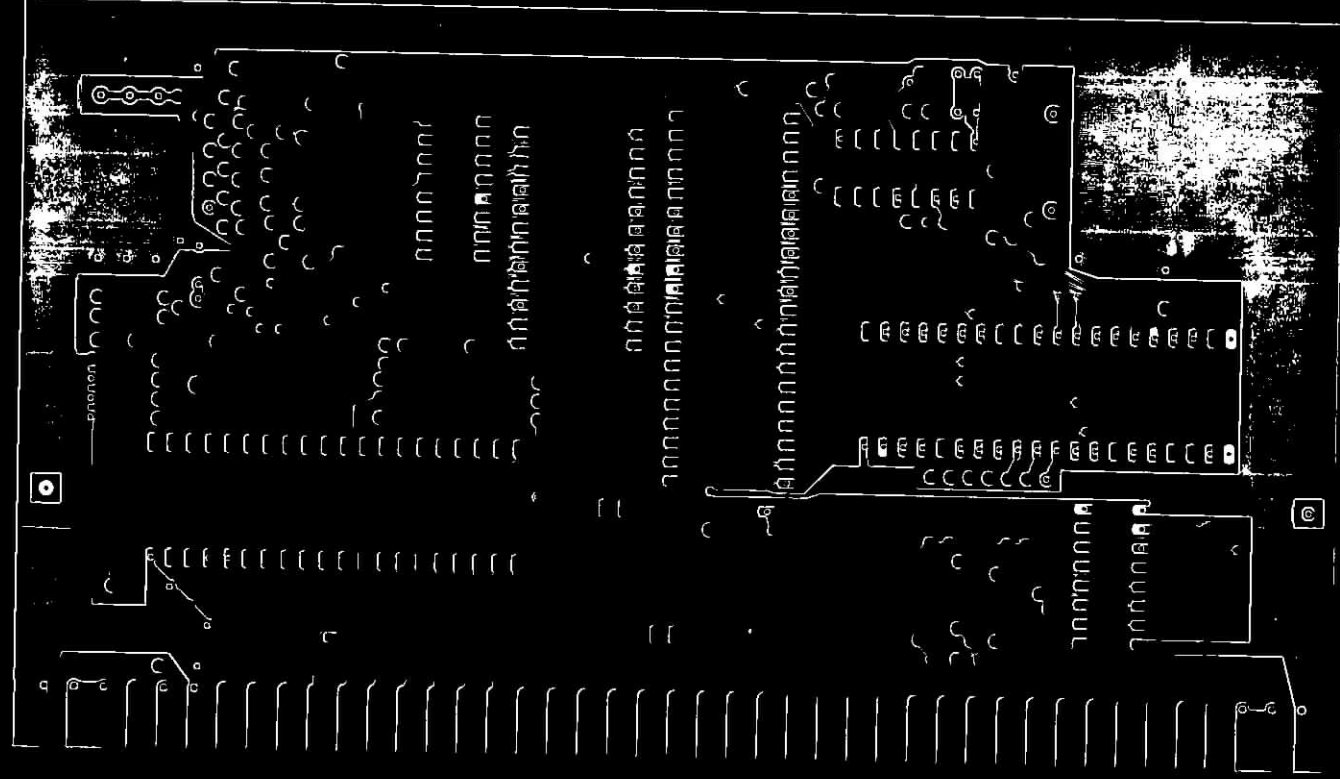
COMP SIDE VIEWED FROM TOP

WRONG



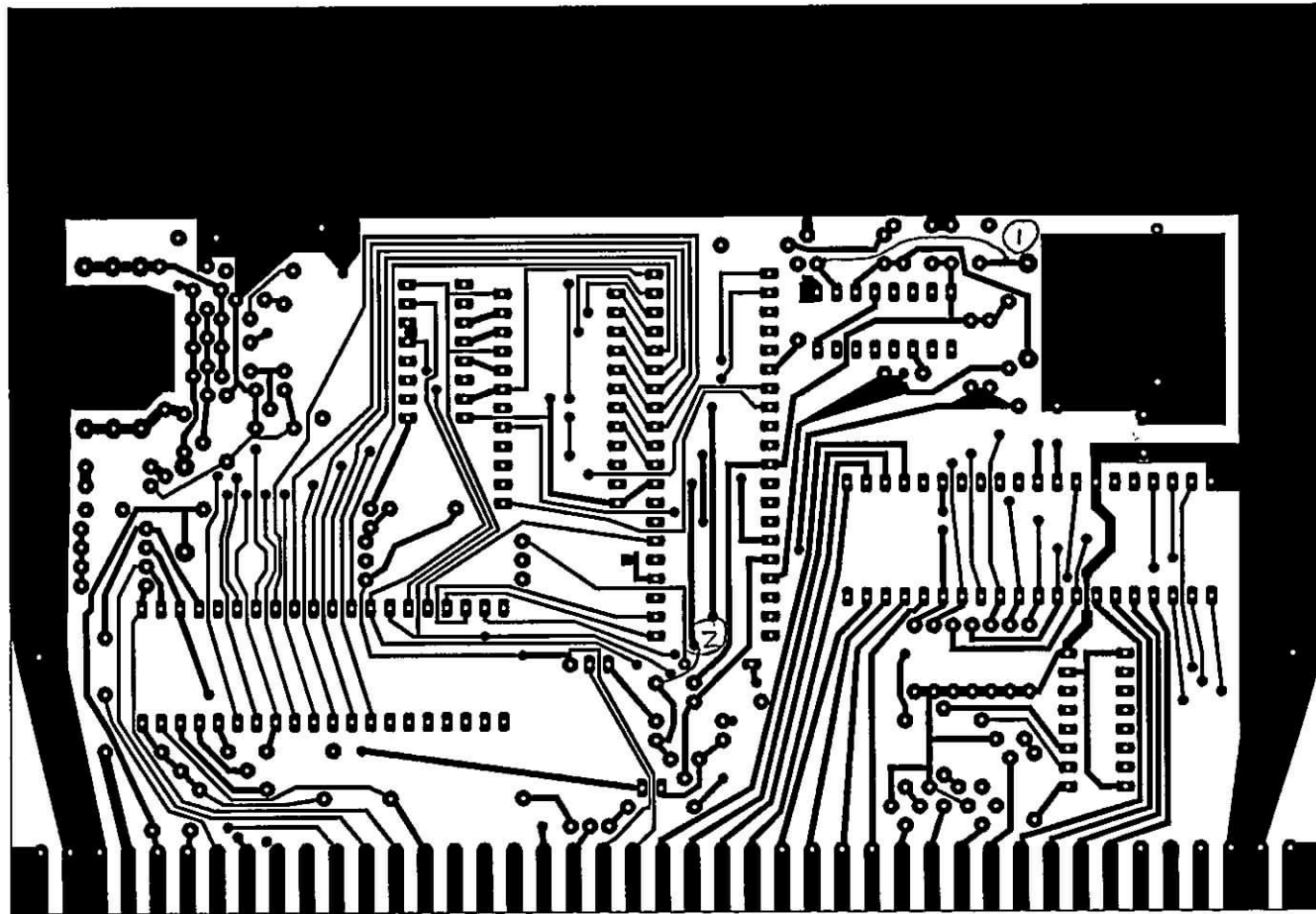


Down



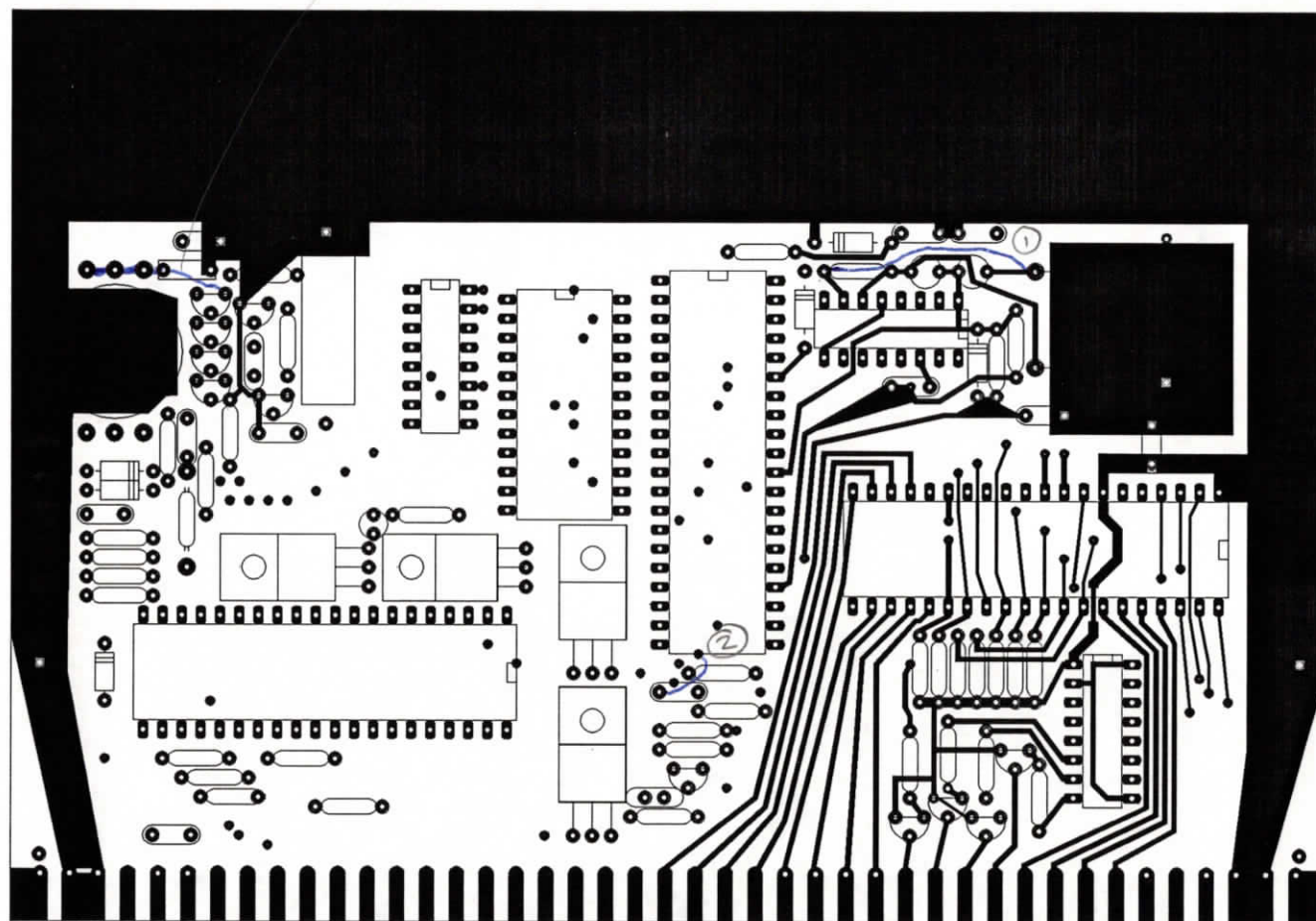
Corrections:

2



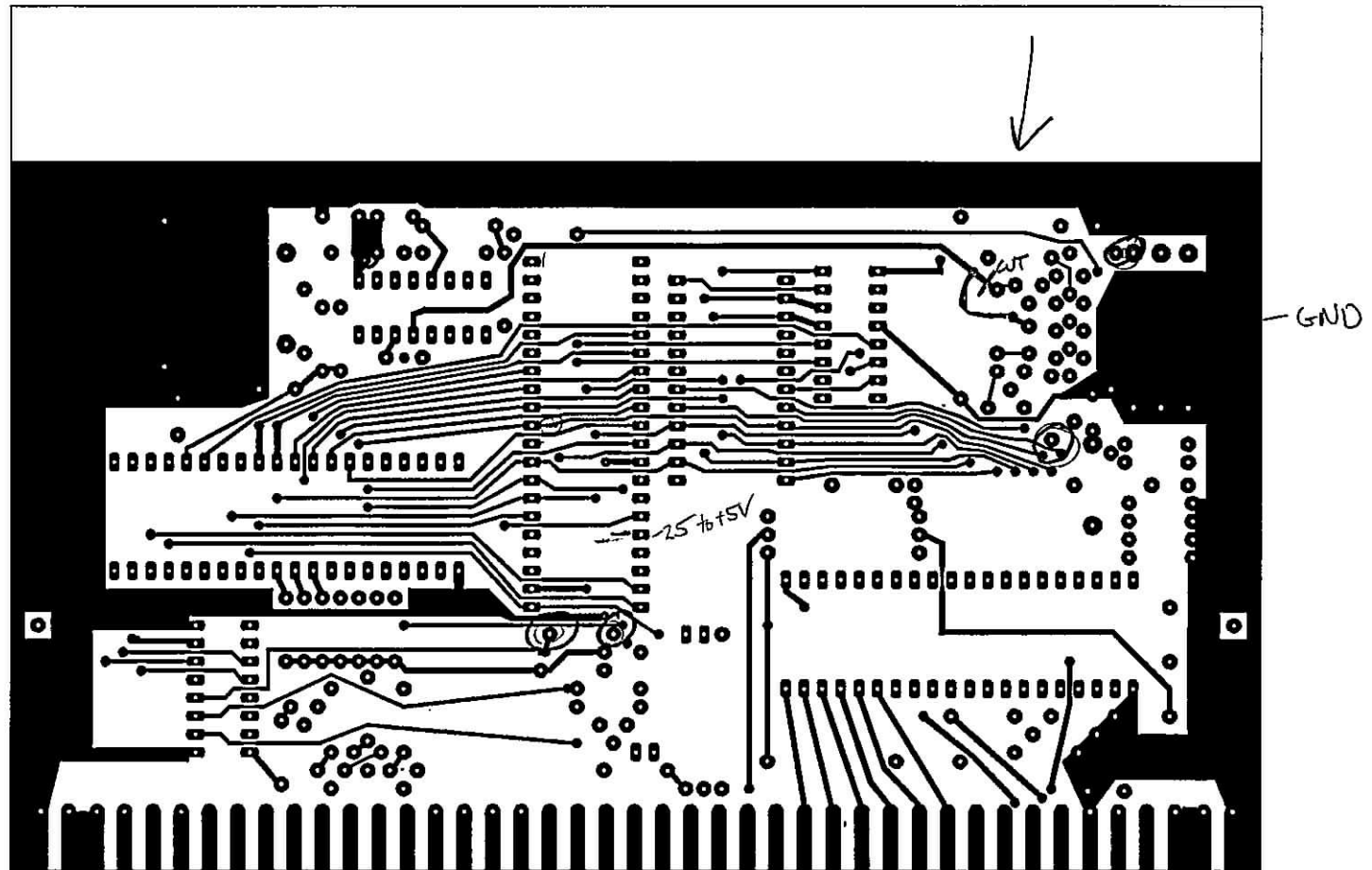
2 Missing traces
on sold side
Blue here = jumper
1 cut 1 jumper on comp side
see board

OK



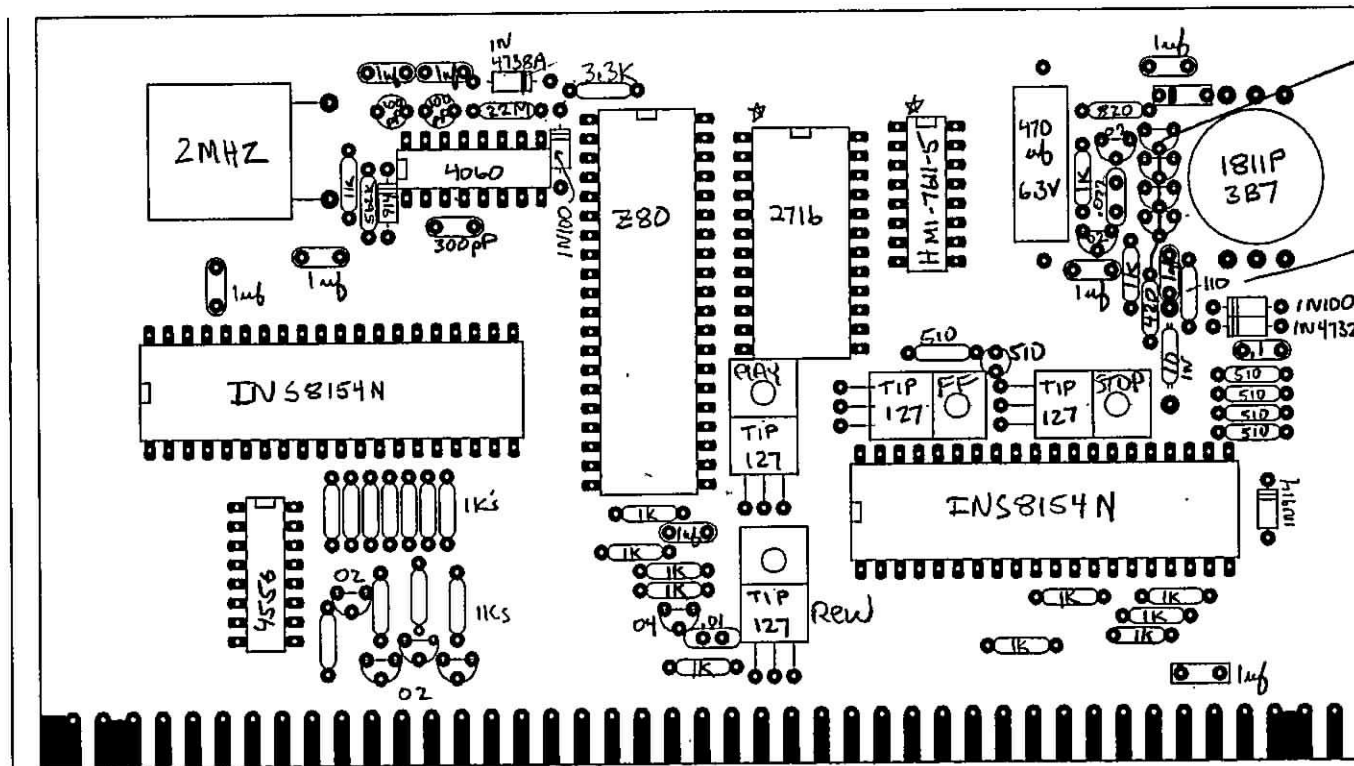
SOLDER SIDE

1 cot jumper



COMPONENT SIDE

* Programmed

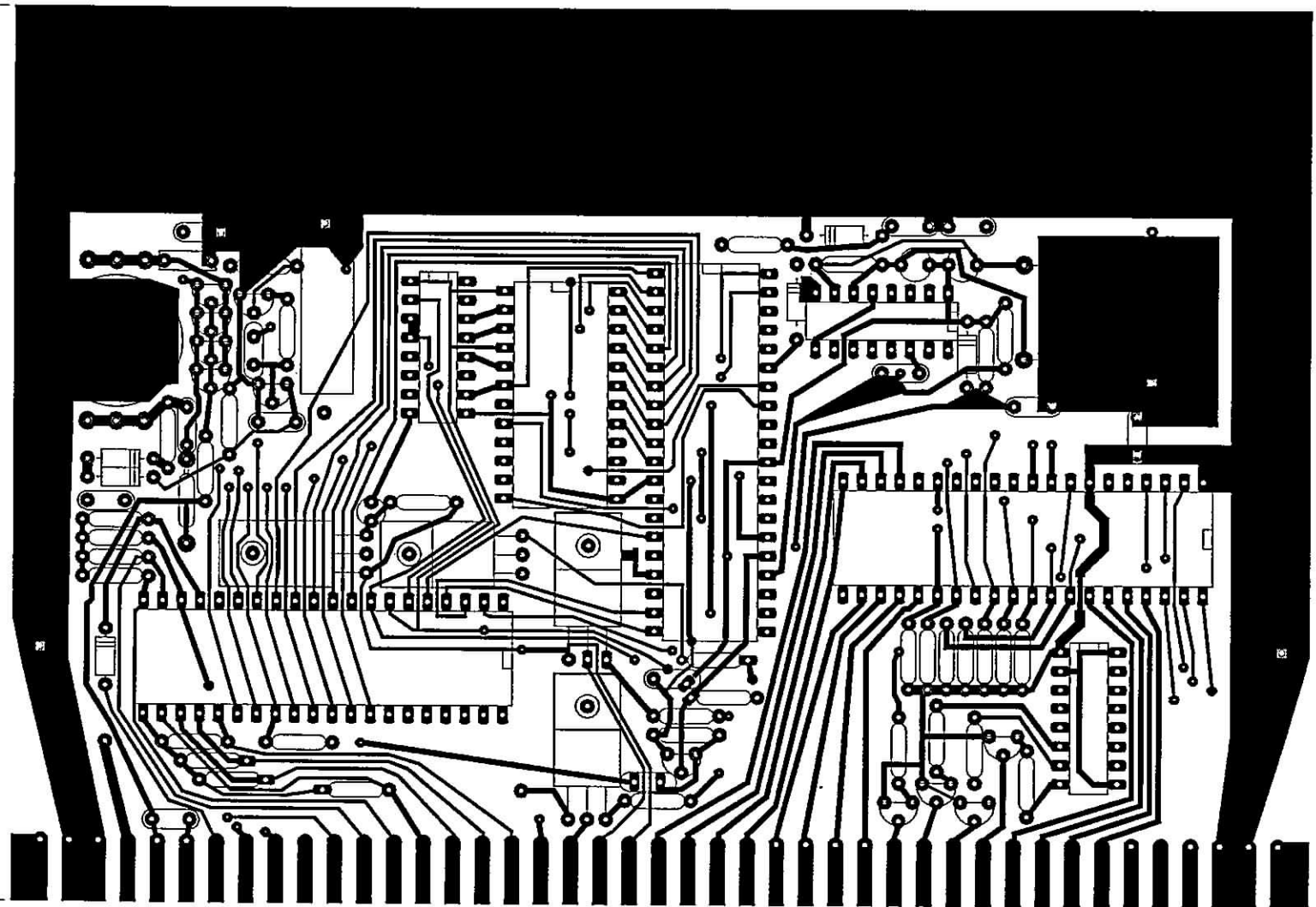


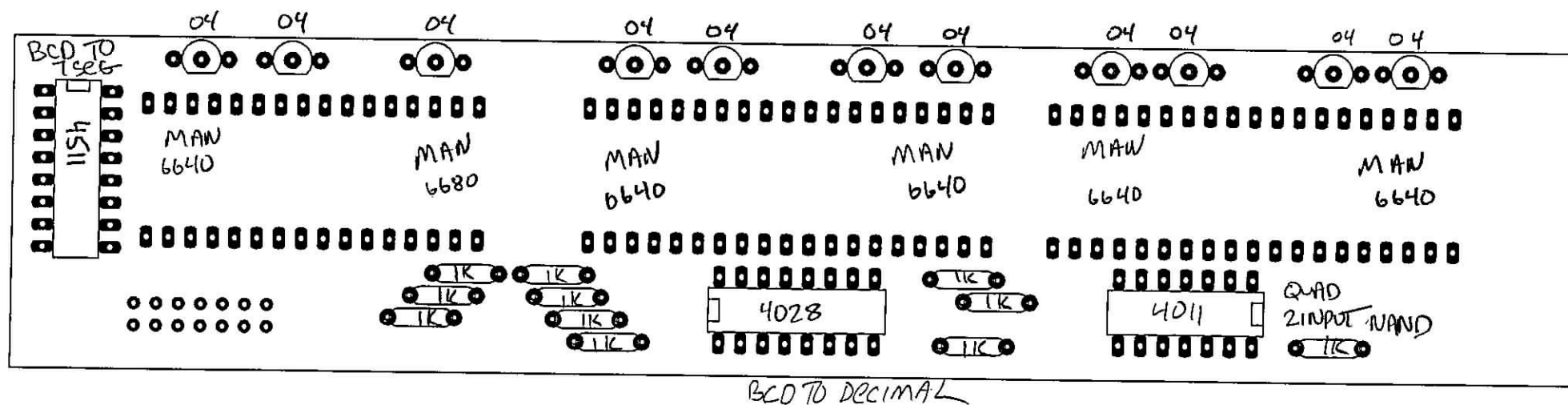
(4)

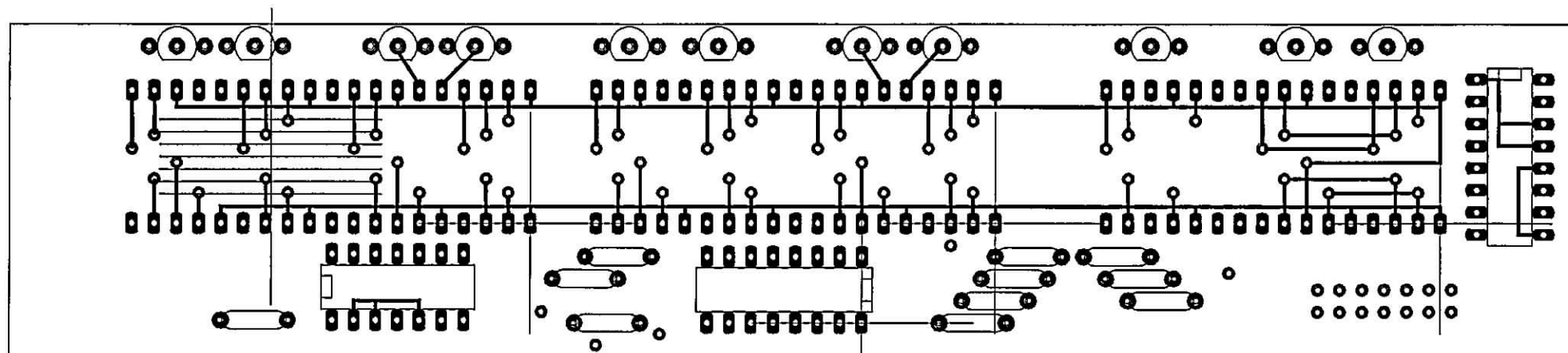
ZTX
650

used to be
Z.Res (1) 100Ω
(2) 10Ω

CT
3-26-90



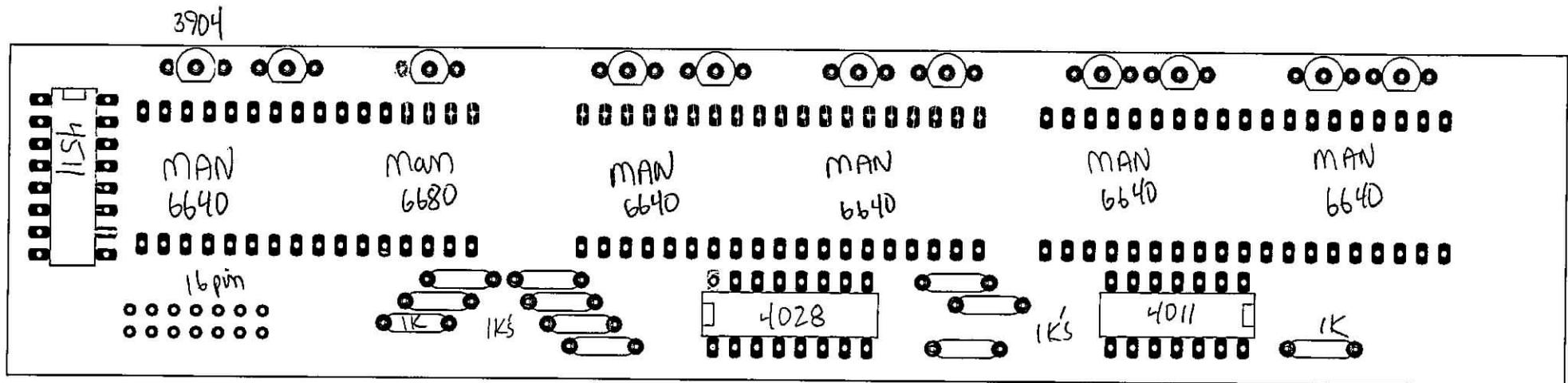


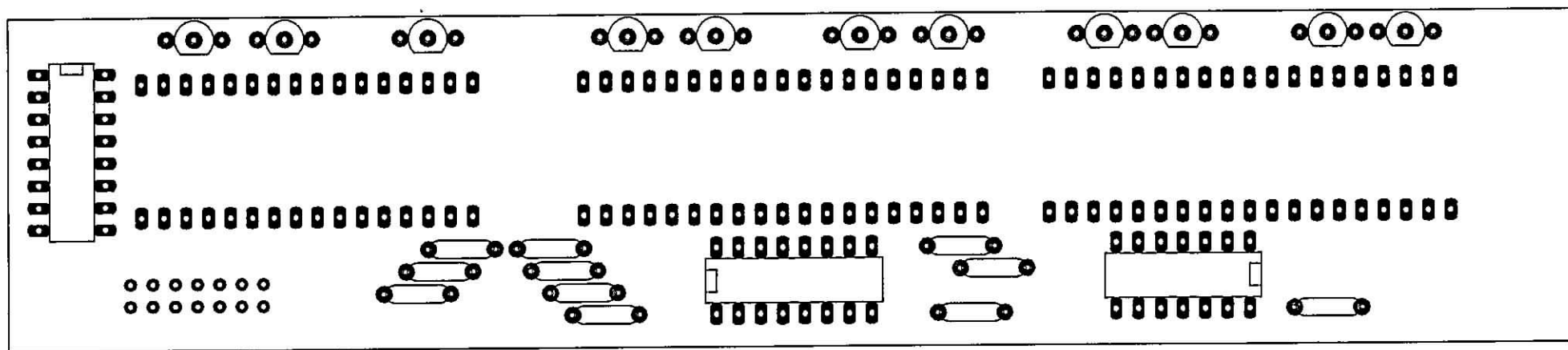


4511 - BCD-to-7seg latch/dec/driver
 4028 - BCD to decimal decoder / bin to octal
 4011 - QUAD 2 input NAND $\overline{D}o - \times 4$

ST-DISP

FRONT



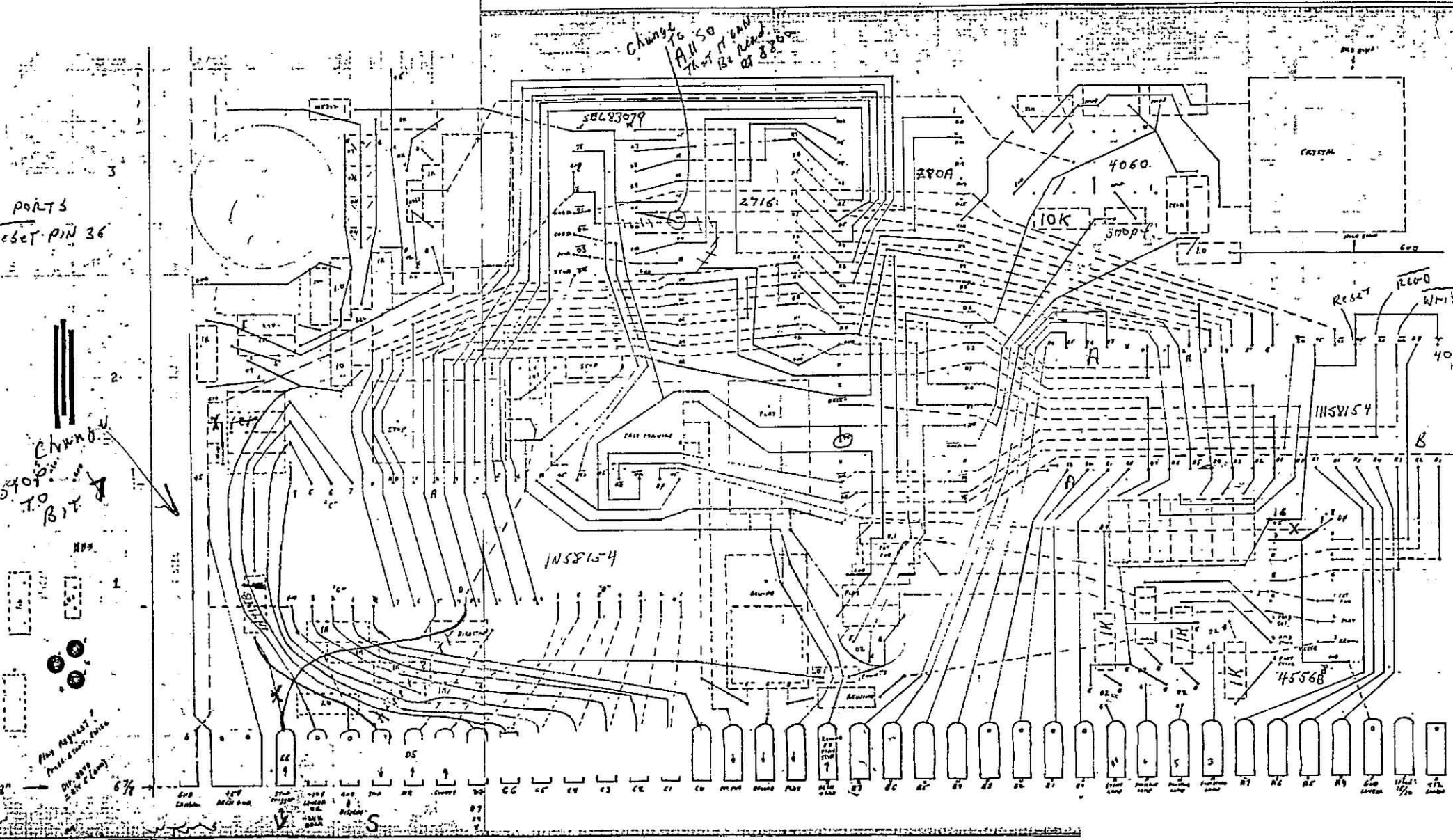


ебег. PIN 36

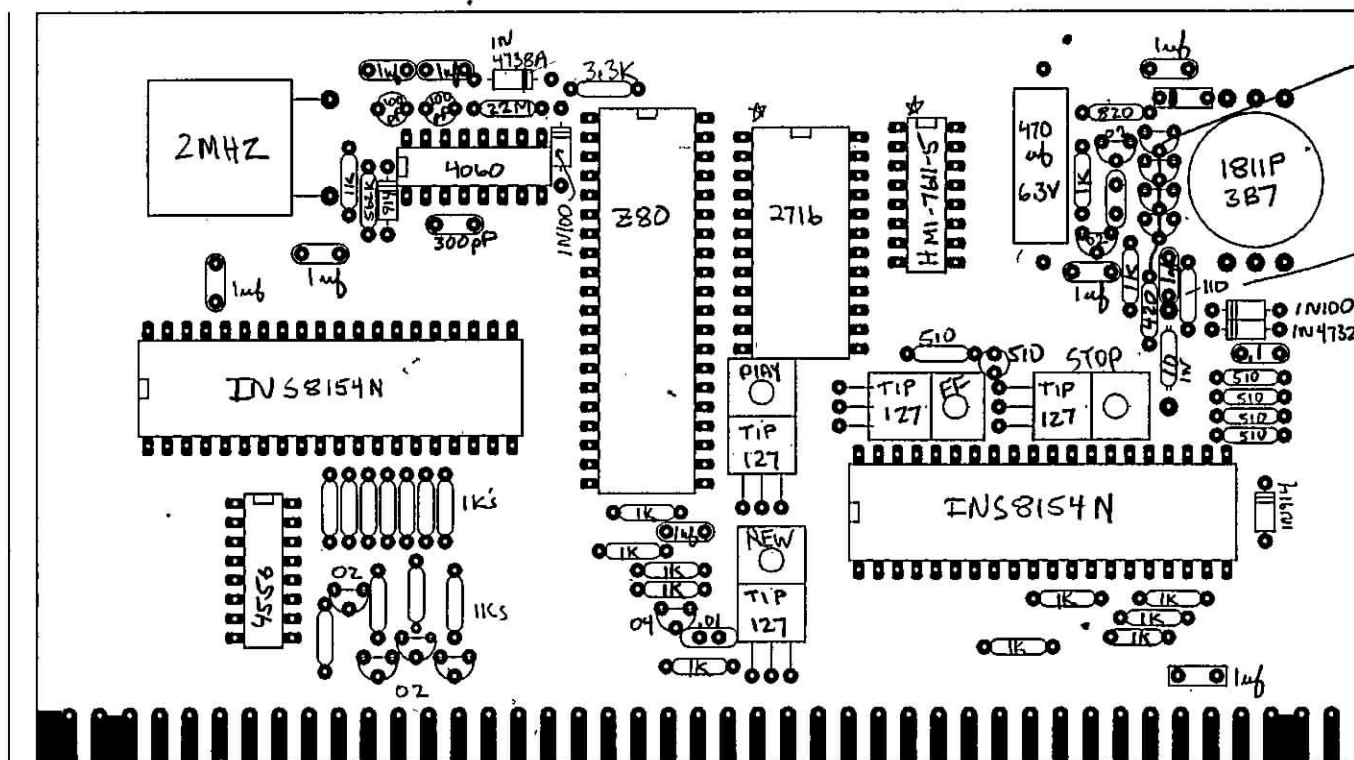
Chenob
to Bit

119

Play August
Press. 6-10-78, Police
DIP-2078
p. 5 (copy)



* Programed



(4)
— ZTX
650
ECG 123' }

used to be
2. Res (1) $100\ \Omega$
(2) $10\ \Omega$

010.000 pf

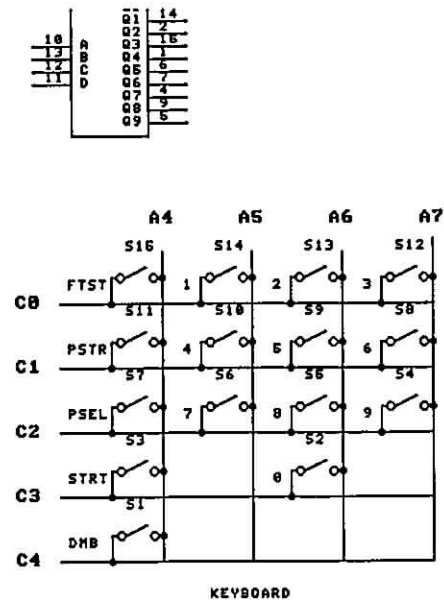
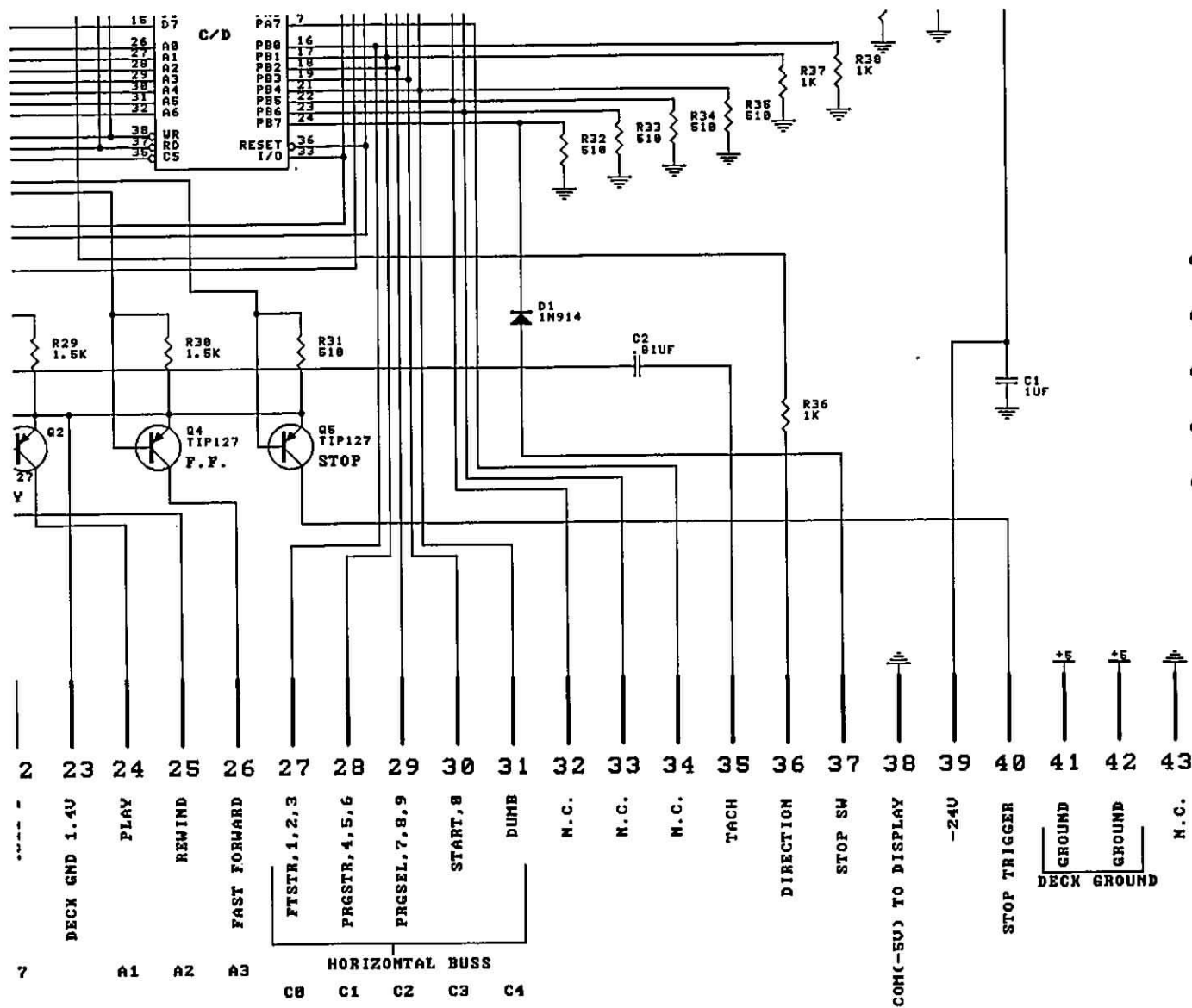
FLG 85
 ↳ 2N3704 (6)
 1.1M (5)
 1.5K (20)
 2mHz (3)

ECG
290A

2W 3702 (12)
TIP 127 (5)
510 (25)
1021W (5)
1W 4732A (4)
1W 4738A (4)

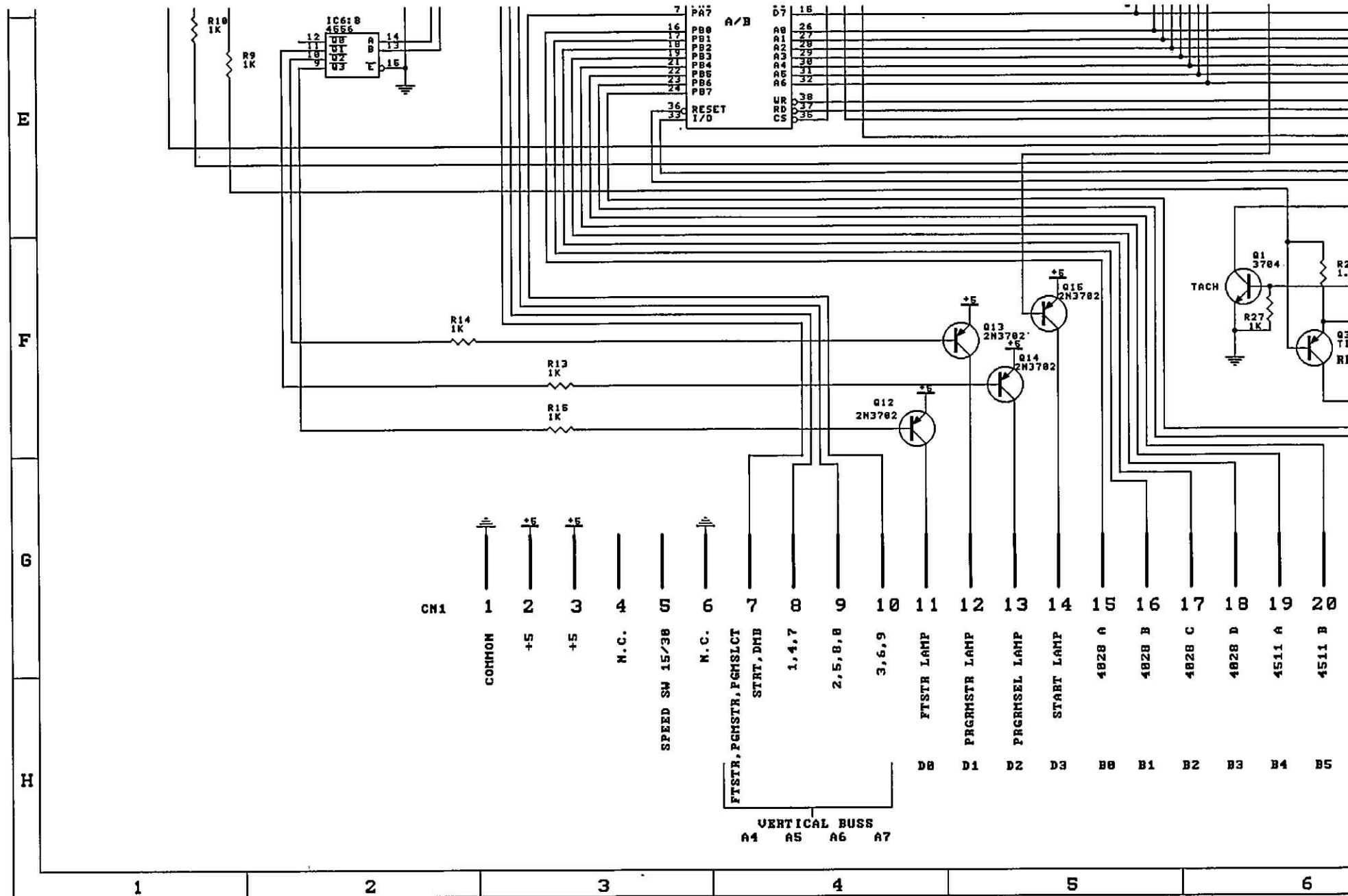
3.3K (25)
470uf 6.3V (3)
420 (10)
820 (10)
4 glass epoxy diode
562K (10)
22 1W100 (10)

10914 - (10)
126 - (10)
.01 (10)

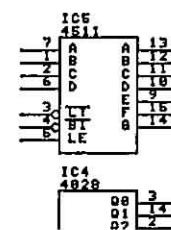
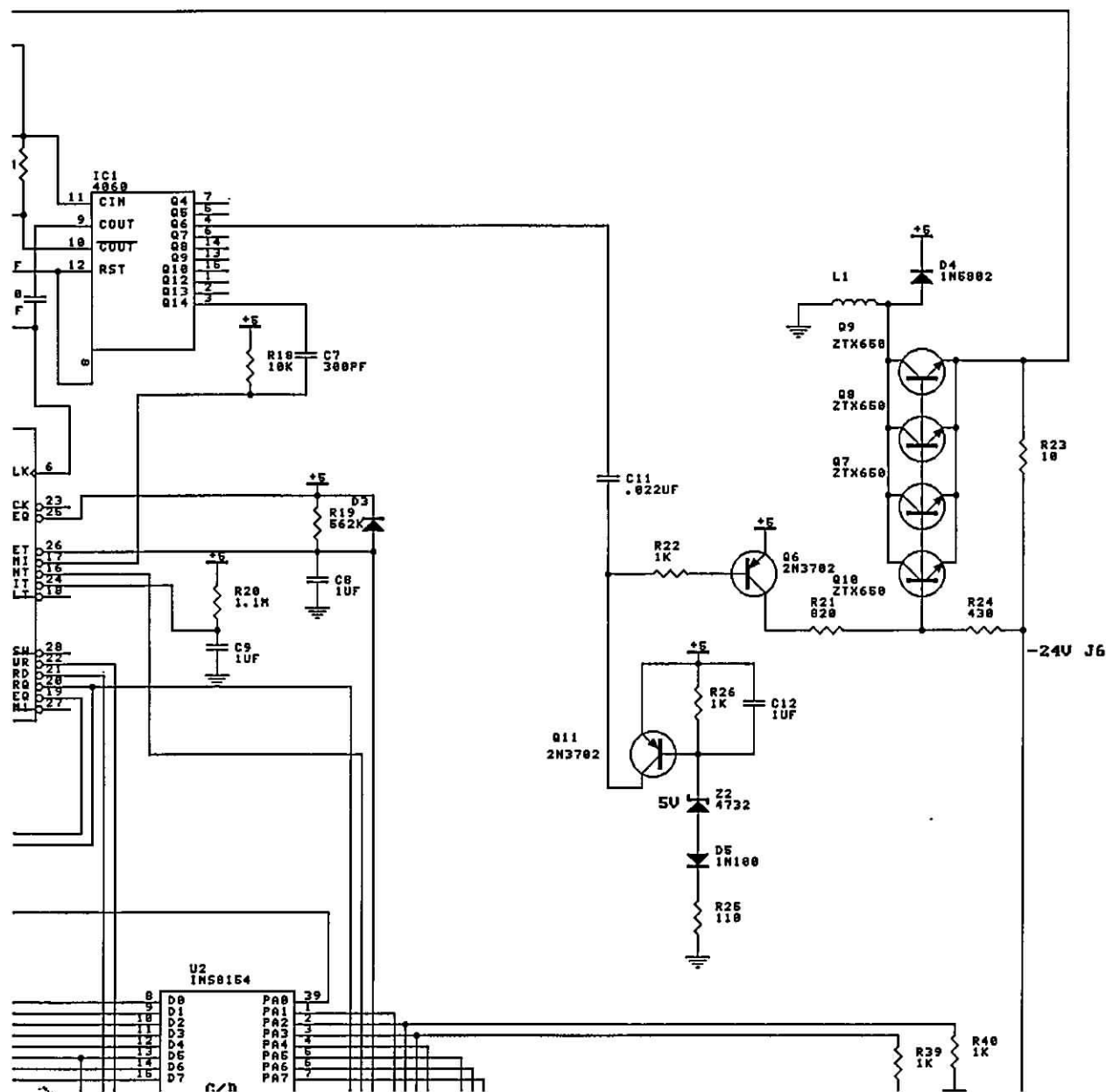


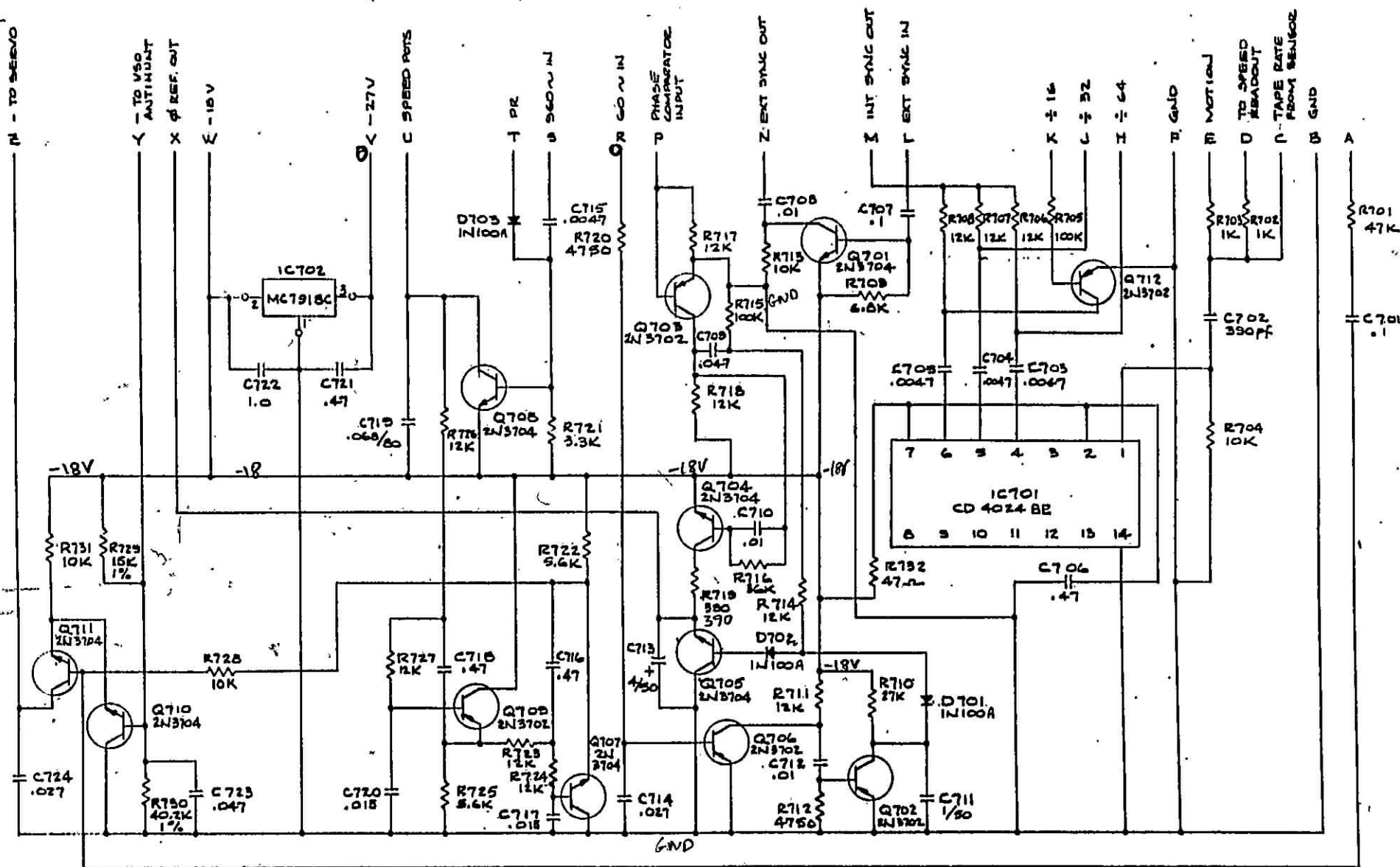
Title				
STEPHENS Q11 LOCATOR				
Size	Number	Revision		
D		A		
Date:	11-06-92	Sheet	1 of 1	
File:	ST COMP	Drawn	By CORNEL	

7	8	9	10	11	12
---	---	---	----	----	----



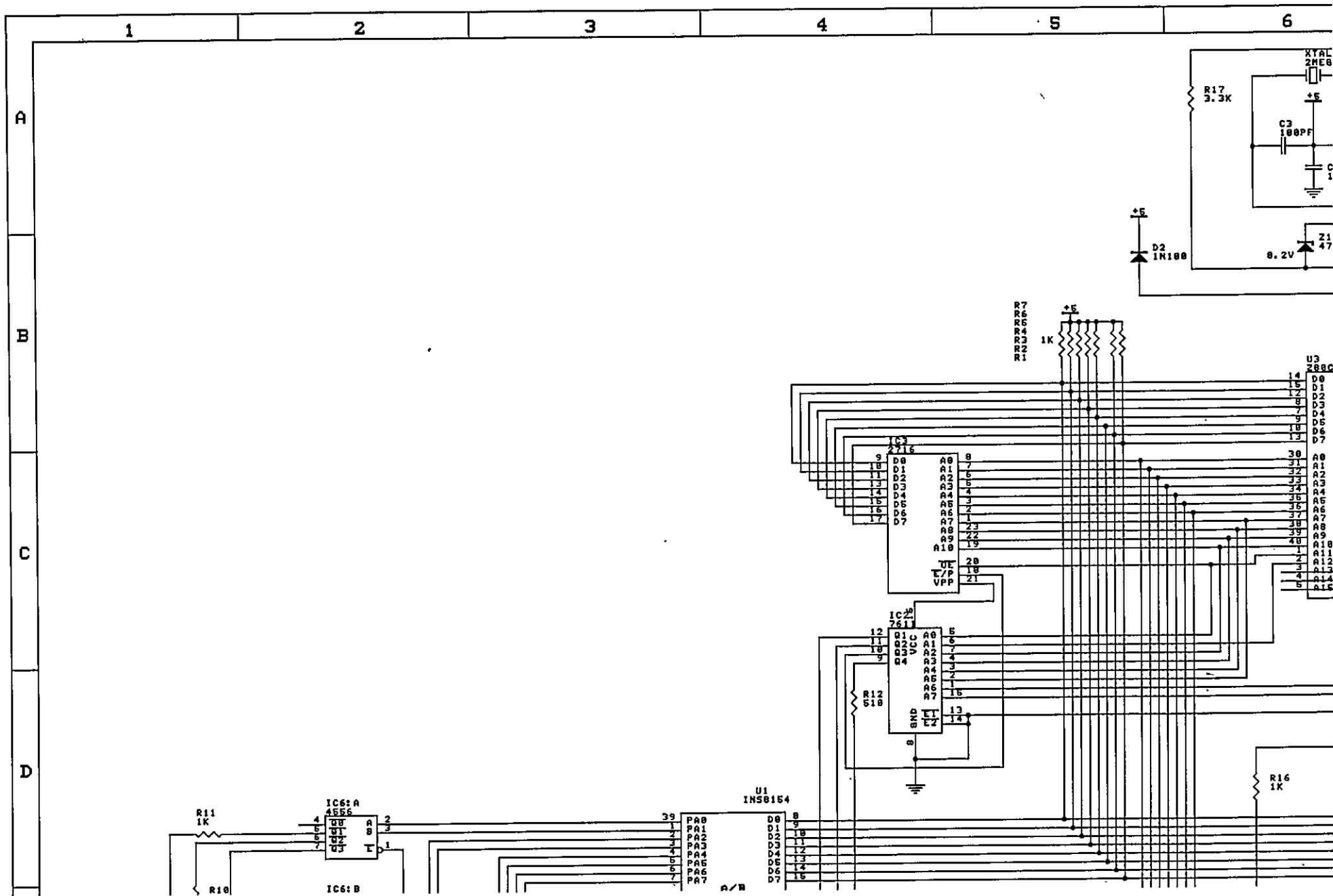
7	8	9	10	11	12
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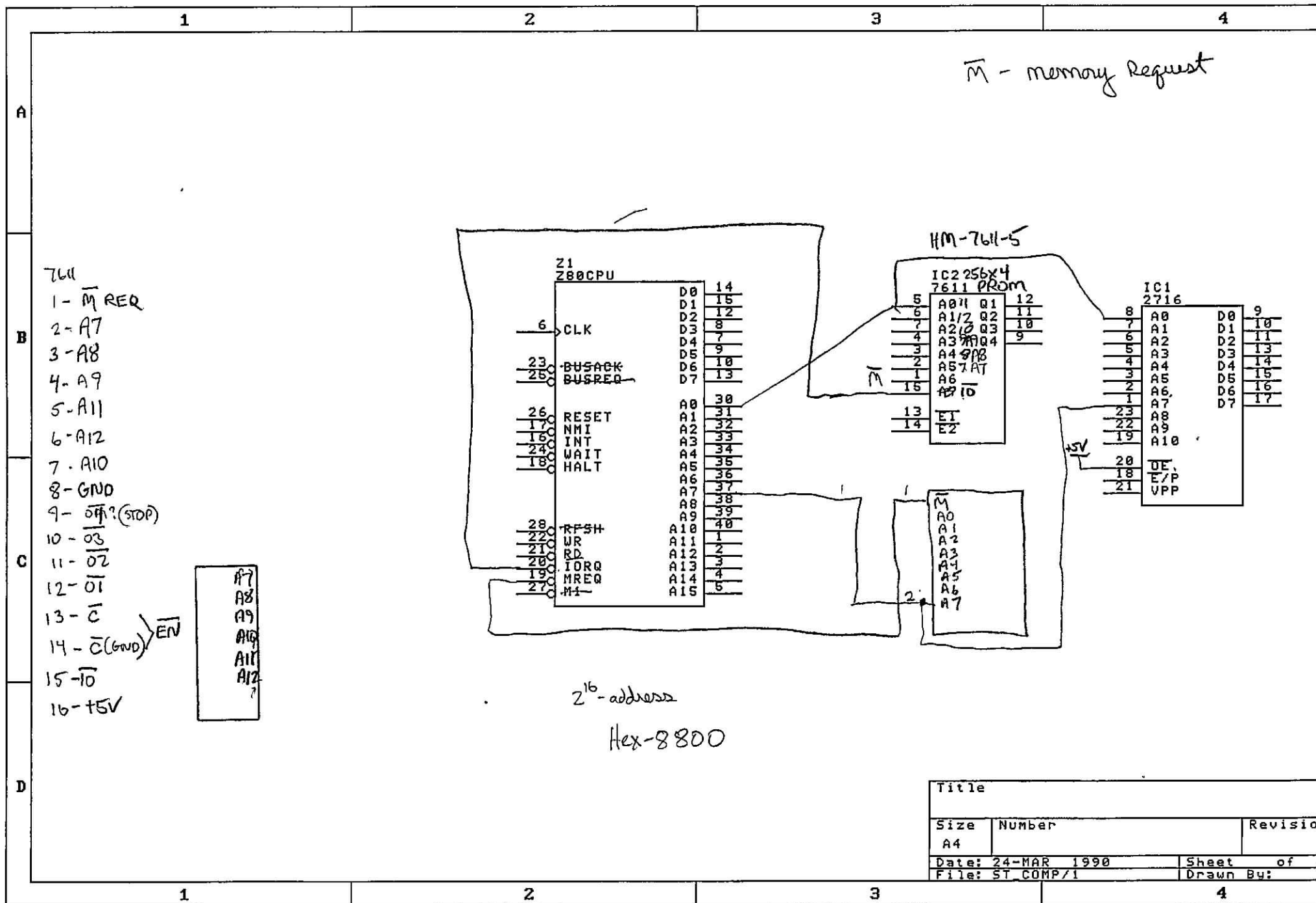




ALL CAPACITORS 50VOLT AND IN MICROFARADS
ALL RESISTOR 1/4 WATT

STEPHENS ELECTRONICS, INC.		
SCALE:	APPROVED BY:	DRAWN BY: G. Gier
DATE: 17 APR 78		REVISED: 8-28-80
SCHEMATIC CONVERTER CARD - 310164 A		
MODELS	REVISIONS	DRAWING NUMBER
1000-1010	6-11	50-0701A





Title		
Size	Number	Revisio
A4		
Date: 24-MAR 1990		Sheet of
File: ST_COMP/1		Drawn By:

1

2

3

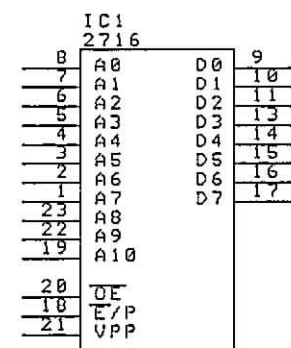
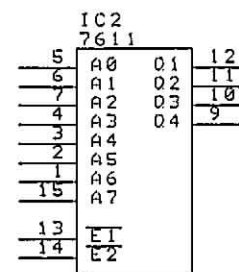
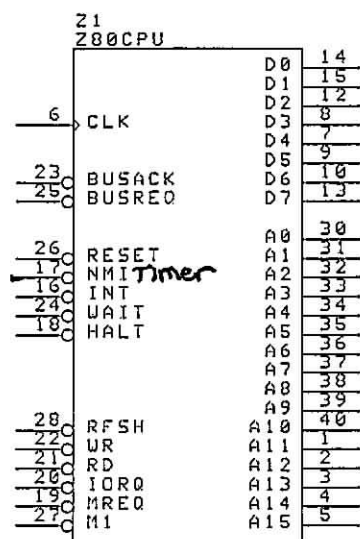
4

A

B

C

D



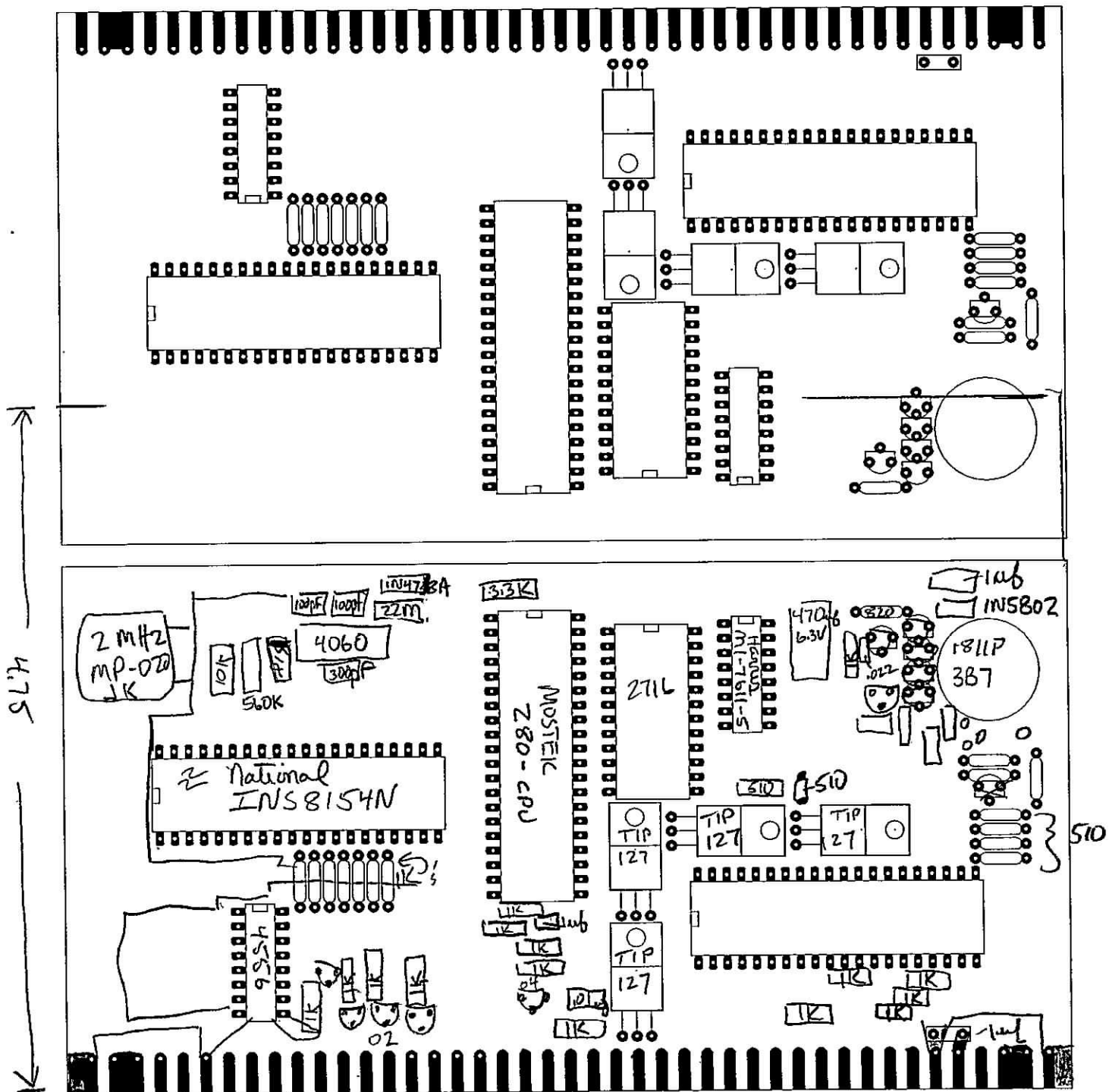
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Size	Number	Rev
A4		
Date: 24-MAR 1990	Sheet	
File: ST_COMP/1	Drawn By:	

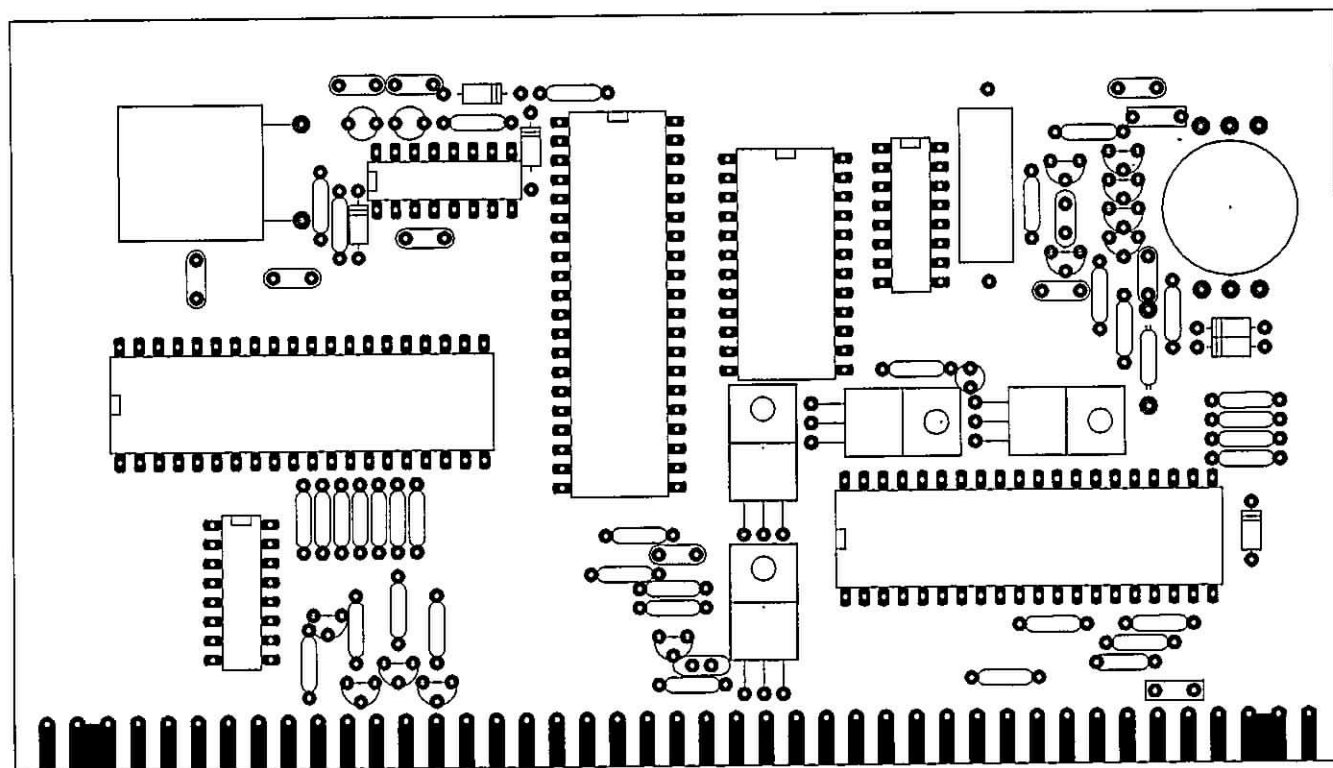
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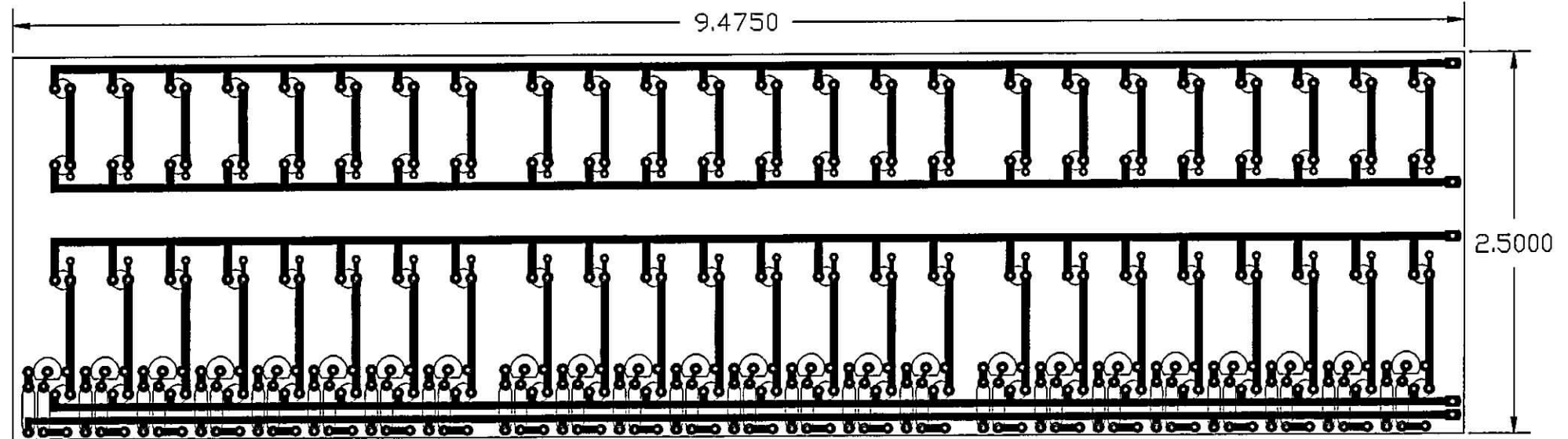
2

3

4

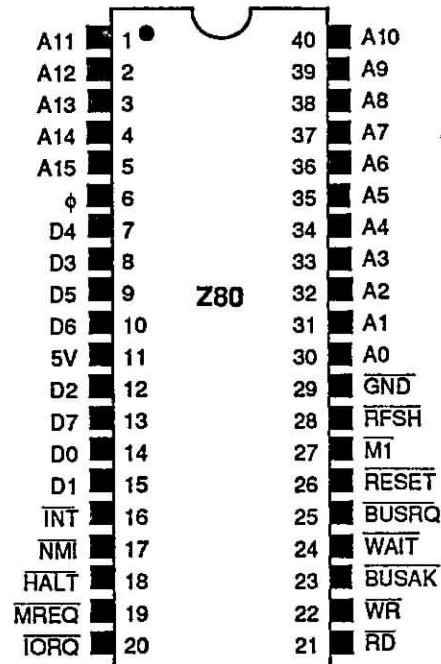
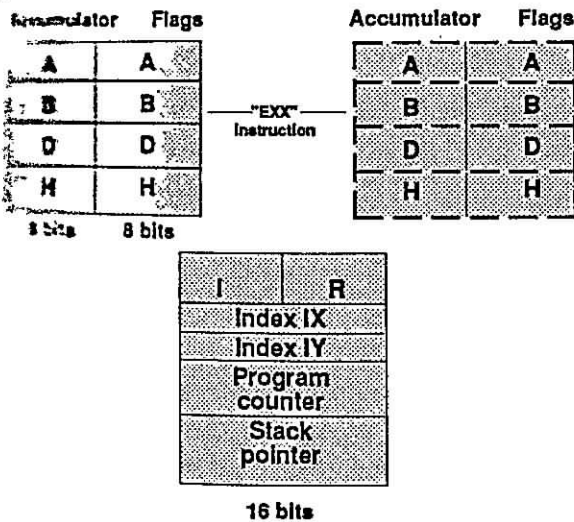






Zilog Z80

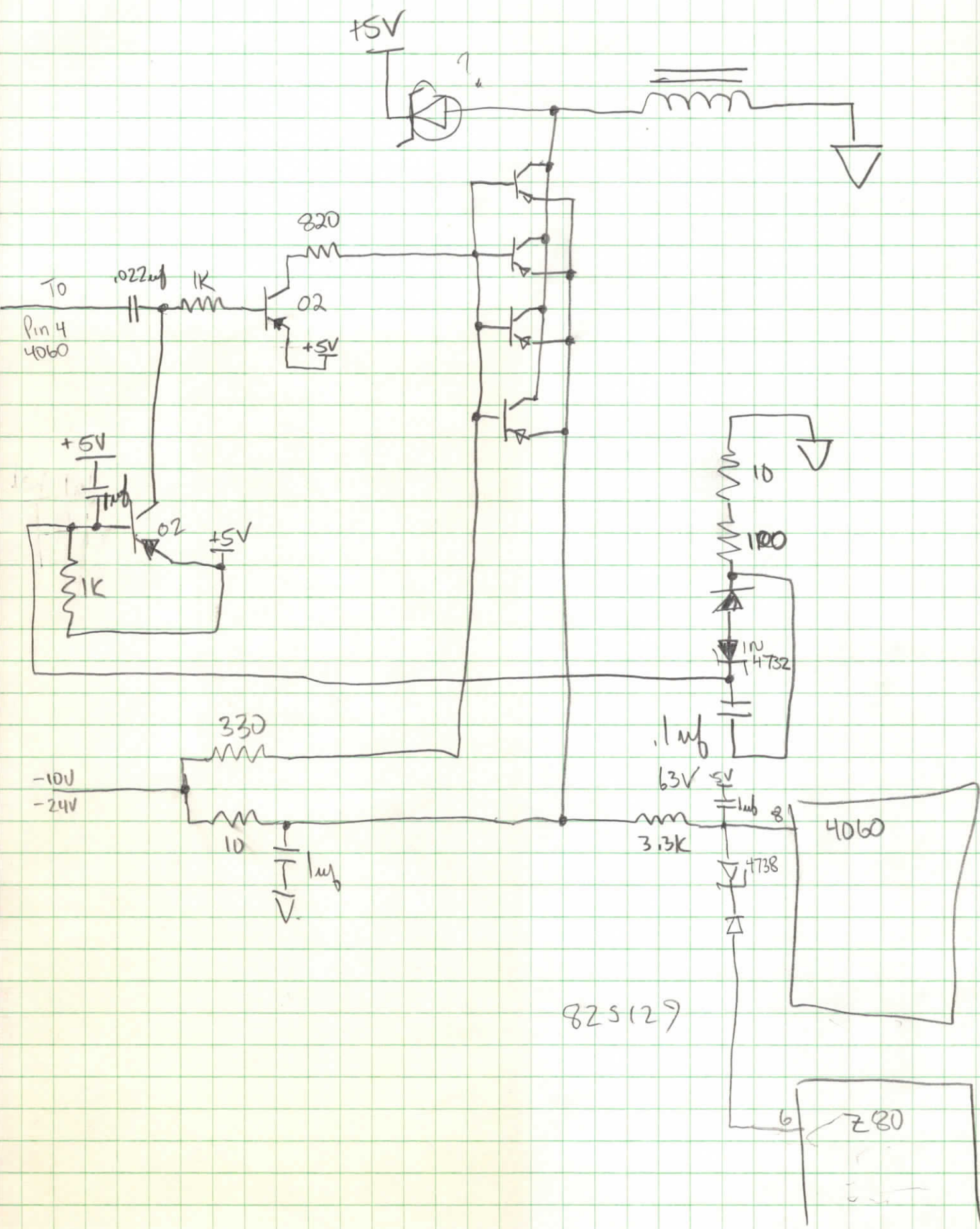
The Zilog Z80, a product of designers who left Intel to start their own company, has many unique features with certain 8080 and 6800 features. Part of its great appeal comes from the fact of its compatibility with 8080 code, so that a program written for the 8080 will run on the Z80 without modification. The reverse, however, is not true. The curious but predictable result of this one-way-only compatibility has been that most of the machines running the CP/M operating system are designed for the Z80, most of the programs written under CP/M are written in 8080 code. CP/M was itself written in 8080 code and the earlier CP/M computers were Z80 machines. TP/M, a CP/M-like operating system written in Z80 code for the 8080, has not been widely used. The Z80 has often been called a second-generation 8080 because of this software compatibility and because some of the same instructions used in the Z80 are used in the 8080. Zilog has managed to produce a microprocessor with a healthy longevity in an arena highlighted by very short product lives.

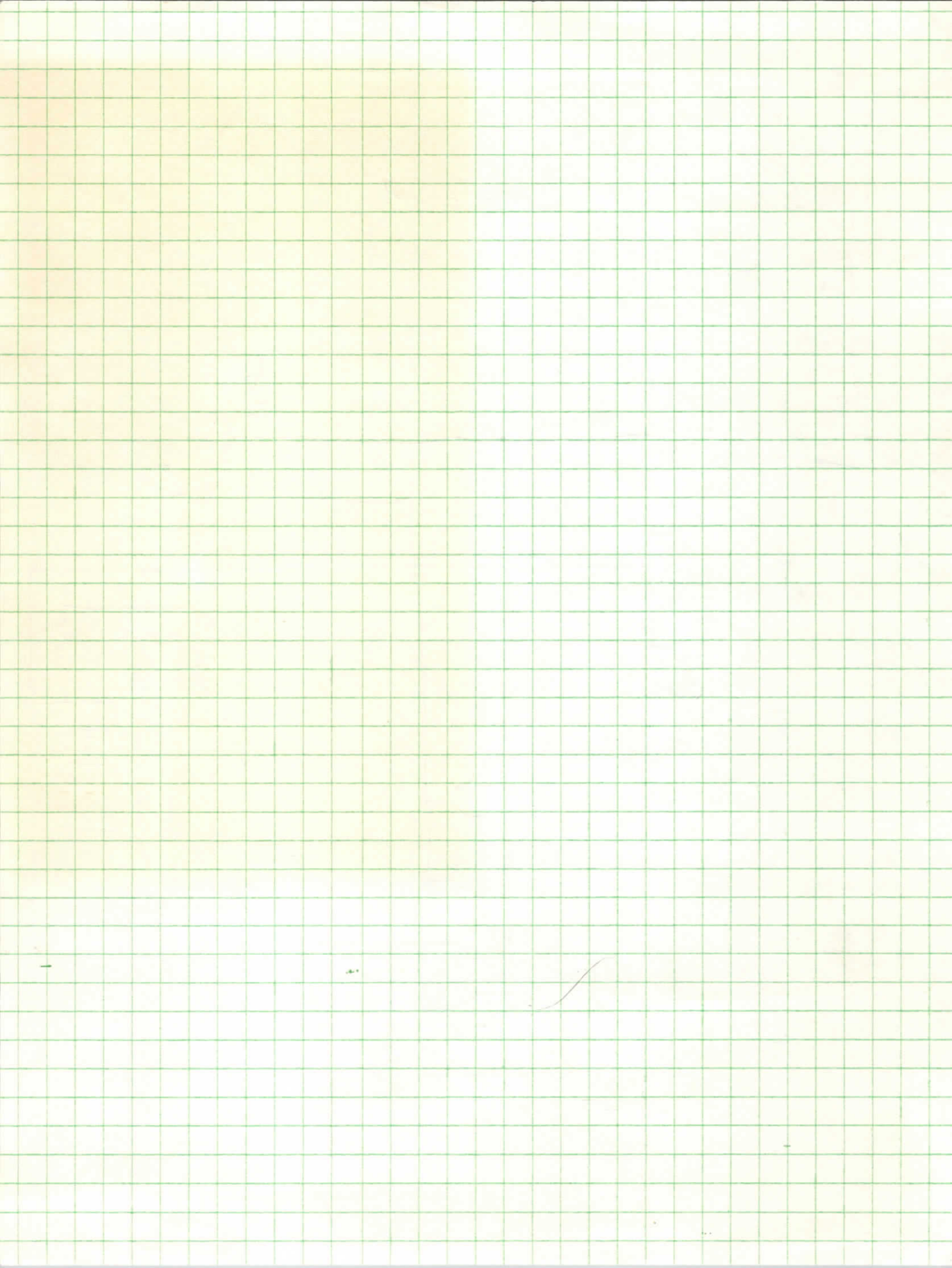


FLAGS

- Carry Flag** If the instruction generates a carry or a borrow, this flag is set.
- Zero Flag** If the result of the operation is a zero in the accumulator, this flag is set.
- Sign Flag** Represents a negative number. If the operation results in a 7-bit high in the accumulator, this flag is set because a 7-bit high is a negative number.
- Overflow Flag** This flag indicates the parity of the result in the accumulator when logical operations are performed. It also indicates overflow.
- Carry Flag** Used by the DAA instruction for BCD operations.
- Subtract Flag** Indicates what type of instruction was performed most recently so that the

1.8, 1.95





- 40 pm

40 pün

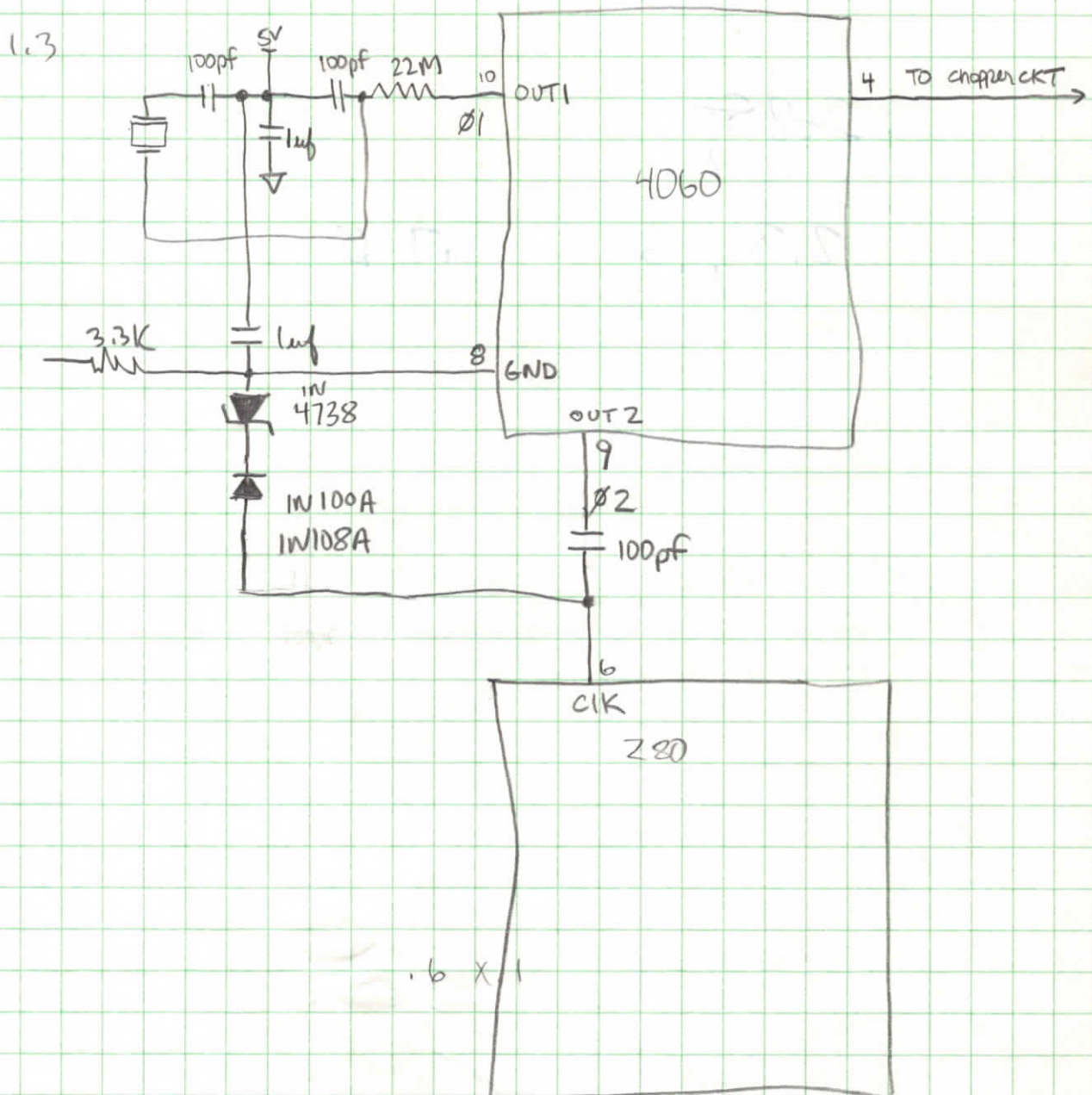
24

24 p.m

- 16 pm

- 16 pm

Dual binary 1 of 4 active low outs



~~2.25,~~

2.3, .5

.7 0

8.4 = 2.4.2

5.7
2.8

10-16

11-35

2.95

16-10

1.15

Computer

43 Pin card edge con.

	Solder side	Comp Side
A	GND	
B-C	+5 (LAMBDA)	double pad
D	+12 not used	double pad
E	Speed 15/30	
F	GND	
H	A4	
J	A5	
K	A6	
L	A7	
M	Foot store lamp	
N	data store lamp	
P	prog select lamp	
R	start lamp	
S	B0	
T	B1	
U	B2	
V	B3	
W	B4	
X	B5	
Y	B6	
Z	B7	

Deck GROUND (logic common +1.4V) to TIP 127 Emitters, ^{collectors} to deck

Play

Rewind

Fast Forward

C0

C1

C2

C3

C4

C5

C6

count (tach)

DIR

stop

GND

D1

D2

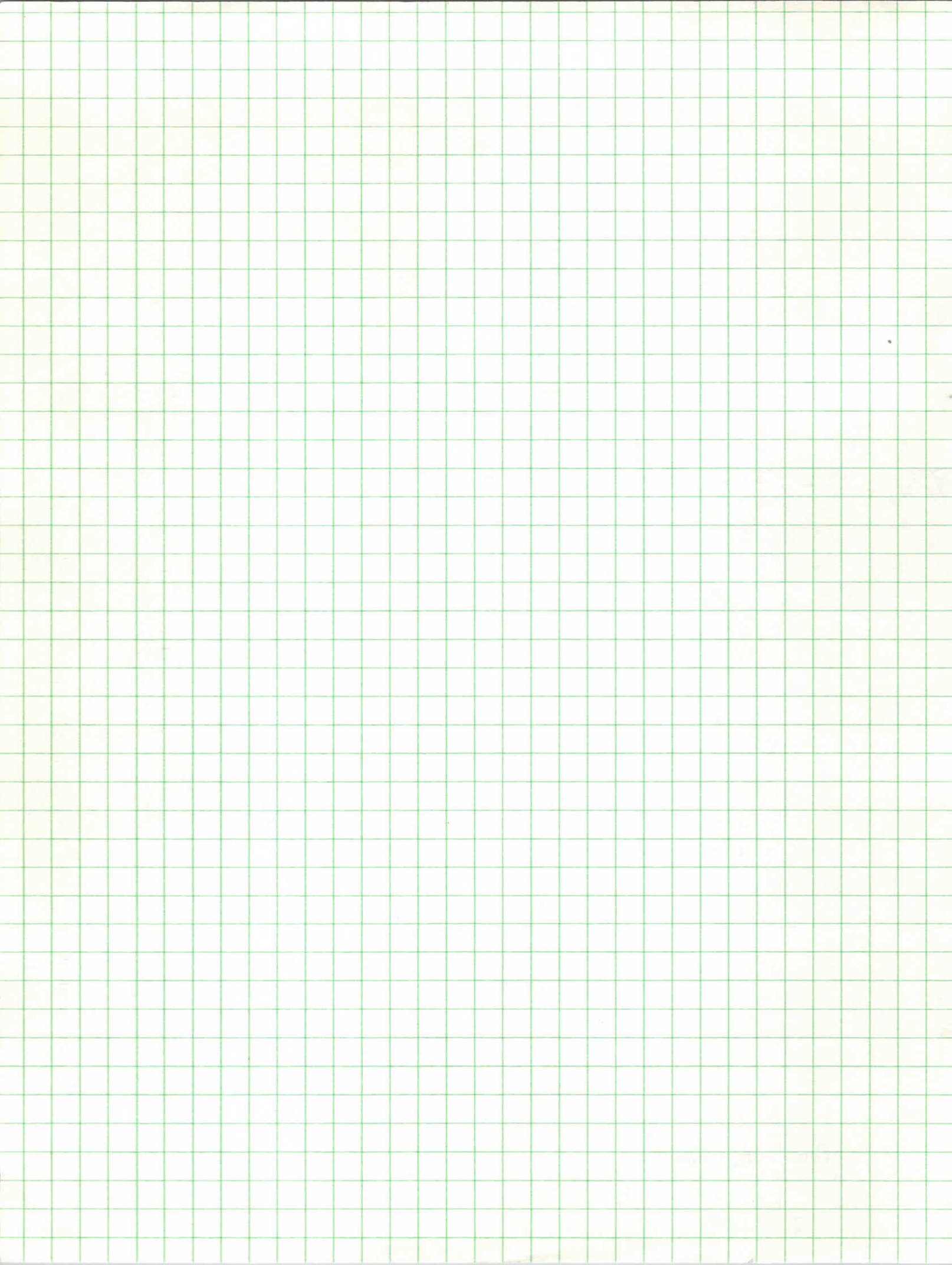
D3

D4

D5

D6

D7



Light from led A1, biased by R6 (R1 & R2 no longer used) goes through tack generator disc into photo transistor (A1), through cap C1 to transistor Q 32 and into Q 33.

(4)

(5)

Signal then goes through C2 to coincidence counter Q34 and Q35, which eliminates spikes. (Wave Schaper)

(6)

Signal then goes to frequency doubler Q36 and Q37 which doubles 480 Hertz to 960 Hertz @ 15 ips. The output is labeled (#7) on print.

(6)

Here the signal splits;

#1) one side goes up to countdown circuit IC-#1

(10)

#2) and other side goes down to the converter

(8)

#3) input to anti-hunt circuit

(19)

The 960 Hertz signal goes to test point A thorough buildout resistor R8.

The 960 Hertz signal goes to the frequency to volts converter (right board in card pin S and through C15 to Q11 where a precision capacitor C16 is charged. This is the saw-toothed wave form generator.

(8)

The discharge rate of C16 determines the place speed of the machine and is controlled by the three sets of resistors R28, R29 for 60 ips, R30, R31 for 15 ips and R32, R33 for 30 ips. Each of these are to ground through

~~selector switches.~~

The signal then goes through a two-stage low-pass filter network Q30 and Q31 which eliminates high frequency spikes.

(22)

The output of the lowpass filter produces an error signal of varying DC level which feeds Q12, one half of differential amp Q12 and Q13.

(9)

Ref page 4 The other half of the differential amp Q13 receives its input from the phase detector via the VS0. The differential amp has a capture range of +/- 5%.

(9)

The output of the differential amp, pin Z - card 164, then through pin F - card 163 and feeds the preamp transistor Q15 which drives Q16, the motor transistor, and the takeup motor.

(14)

(16)

Reference C15, line 3E goes to card 164 pin A and then up through R82 to point 6B. This is the input to Q25.

(20)

When the tack generator is running Q25 is shut off. This also shuts off Q27 so that the tape lifter is inhibited. When the tack generator has output (Tape running).

(20)

However, when in rewind or fast-forward, Q26 turns on, which

~~Q25 has motor input;~~

Q25 has many inputs;

#1) a 960 Hertz recognition input from the tack generator. (20)

#2) a DC inhibit signal from the load switch through CR25.

When the VSO is in the sync position, not normal run mode, it bypasses the output of the phase detector and uses a resistor network which supplies a DC voltage.

These two voltages are summed at the output of Q12 and go to the input of the servo amp, Q15, Q16 and the take-up motor. (14)

The anti-hunt circuit, Q14, shuts down the counter when the machine is in the stop mode. This keeps the tape lifters from operating when the capstan is made to rotate. It also keeps the motors from turning. (19)

A 960 Hertz signal out of the reference line (7) also goes to the tape lifter circuit. It enters Q25 and goes to Q27 which activates the tape lifter solenoid. (20)

After stop button is pressed the tape lifter will not de-energize until the tack wheel has stopped.

The anti-hunt circuit is Q14. As more current goes through the take-up motor, Q14 goes more negative.

Q26 is the play transistor and is on when play button is pushed, which turns off Q27 and turns on Q13 which turns on the pulling motor servo and relaxes the feed motor servo.

The phase detector receives its input from the countdown chip.

the countdown chip IC-1 has its input from the 960 Hertz tack generator. its output is a divide by 16, 32, or 64. The two outputs not needed are grounded by the speed switches. The divide by :

16 is for 15 ips,

32 " " 30 " ,

64 " " 60 " .

The phase-locked loop is not yet understood.

The output of the countdown chip goes through Q7 also

A 60 Hertz line reference signal through an isolation transformer goes through Q4 , is shaped and filtered and joins Q8 through CR3. Q7 output also goes to Q8 and also goes up to Q6 through a RC filter net (possibly 60 Hertz) and is summed with the output of Q8 and then is smoothed by C14. This signal goes to the VSO and then to the differential amp Q13.

The phase detector output feeds the meter through Q9.

Q18 & Q19 are the rewind and fast-forward circuits.

the supply reel servo has a two-stage preamp Q20 & Q21. The take-up reel servo has a one stage preamp Q15; however it is driven from the output of the differential amp and has more gain there.

The slack pot (200K) biases Q30 which in turn biases Q21 which in turn turns on Q22 the motor XSTR. R74, the 50K holdback tension control ; #1) biases the input to Q20 which turns on Q21 and then Q22 and provides tension on the feed motor and drops the voltage across R60, the 50 watt five ohm resistor. The voltage drop across the 5 ohm resistor is adjusted to 10 volts and is critical.

#2)

All transport mode control functions are turned on by grounding a control line except for Stop. Lifting everything stops recorder.

C1 - .022
 C2 - 1.0
 3 - .1
 4 - 200mf/35V
 5 - 200mf/25V
 6 - .027
 7 - .01
 8 - 1.0
 9 - .01
 10 - .015
 11 - .015
 12 - .015
 13 - .047
 14 - 4mf/50V
 15 - .001
 16 - .068 1%
 17 - 1.0
 18 - .47
 19 - .01
 20 - .1
 21 - .005
 22 - .01
 23 - .47
 24 - .027
 25 - ~~.01~~
 26 - 35/50
 27 - .047
 28 - 150/25
 29 - 1.0
 30 - .027
 31 - .1
 32 - 200mf/25
 33 - 1.0
 34 - 1.0
 35 - 1.0
 36 - 1.0
 37 - 1.0
 38 - 1.0
 39 - 1.0
 40 - .1
 41 - 35/50V
 42 - 8/25V
 43 - .01
 44

C46
 C47
 C48
 C49
 C51

CAPACITOR
 CHART

HIGHEST NUMBER
 C43

- ① 10K POT
- 2 - 1K
 - 3 - 27K
 - 4 - 82K
 - 5 - 270
 - 6 - 2K - (not in circuit any more)
 - 7 - 36K
 - 8 - 1K
 - 9 - 12K
 - 10 - 4.7K
 - 11 - 36K
 - 12 - 12K
 - 13 - 36K
 - 14 - 390
 - 15 - 12K
 - 16 - 12K
 - 17 - 12K
 - 18 - 12K
 - 19 - 1 MEG
 - 20 - 12K
 - 21 - 3.3K
 - 22 - 100K
 - 23 - 340K
 - 24 25K POT
 - 25 - 100K
 - 26 20K TERN POT
 - 27 - 82K
 - 28 4.02K 1%
 - 29 - 5K POT
 - 30 - 24.9K 1%
 - 31 - 7.5K POT
 - 32 11K 1%
 - 33 - 10K POT
 - 34 - 3.3K
 - 35 - 12K
 - 36 - 12K
 - 37 - 12K
 - 38 - 12K
 - 39 - 2.7K
 - 40 - 2.7K

- ② 40K 1%
- 41 40K 1%
 - 42 15K 1%
 - 43 50K
 - 44 4.7K
 - 45 - 1K
 - 46 - 5.6K
 - 47 - 470
 - 48 - 12K
 - 49 - 100
 - 50 - 5.6K
 - 51 -
 - 52 -
 - 53 4.70 2WATT
 - 54 4.70 2WATT
 - 55 - 150 5WATT 1%
 - 56 - 27K
 - 57 1.8K
 - 58
 - 59
 - 60
 - 61
 - 62 - 27K
 - 63 7.5K
 - 64 270K
 - 65 200K POT
 - 66 - 510
 - 67 - 2K
 - 68 - 15K
 - 69 - 27K
 - 70 - 47
 - 71 - 100
 - 72 - 150 5WATT 1%
 - 73 - 1K
 - 74 - 50K POT
 - 75 - 15K
 - 76 - 1K
 - 77 4.7K
 - 78 - 1K
 - 79 - 2.7K
 - 80 - 2.7K
 - 81
 - 82 - 22K

- ③ 84 - 12K
- 85 - 1K
 - 86
 - 87 - 1.2K
 - 88 - 1.8K
 - 89 - 1.8K
 - 90 - 8.2K
 - 91 - 1K
 - 92
 - 93 - 470
 - 94 - 100
 - 95 - 150
 - 96 - 150
 - 97 - 150
 - 98 - 150
 - 99 - 150
 - 100 - 150
 - 101 - 150
 - 102 - 47
 - 103 - 150
 - 104 - 47
 - 105 - 47
 - 106 36K
 - 107 - 1.8K
 - ~~108 - 1K~~
 - ~~109 - 1K~~
 - ~~110 - 1K~~
 - ~~111 - 1K~~
 - ~~112 - 1K~~
 - ~~113 - 1K~~
 - ~~114 - 1K~~
 - ~~115 - 1K~~
 - ~~116 - 1K~~
 - ~~117 - 1K~~
 - ~~118 - 1K~~
 - ~~119 - 1K~~
 - ~~120 - 1K~~
 - ~~121 - 1K~~
 - ~~122 - 1K~~
 - ~~123 - 1K~~
 - ~~124 - 1K~~
 - ~~125 - 1K~~

R110 - 47K
R111 - 22K

RESISTOR
LIST

NUMBERS NOT USED
42, 51, 52, 58, 59, 60, 61, 8
86, 92

Q1

LEGEND →

2N3702 = "02"
2N3704 = "04"

Q38 - 2N3702 - EXT SYNC AMP

- 2
- 3
- 4 - 02
- 5 - 02
- 6 - 04
- 7 - 02
- 8 - 04
- 9 - 02
- 10 - 02
- 11 - 04
- 12 - 04
- 13 - 04
- 14 - 04
- 15 - 02
- 16 - HEP 36C - OLD NUMBER → 2N6329
- 17 - TIP 29
- 18 - 04
- 19 - 04
- 20 - 02
- 21 - 02
- 22 - HEP 36C - OLD NUMBER → 2N6329
- 23 - TIP 121
- 24 - TIP 121
- 25 - 02
- 26 - 04
- 27 - TIP 29 - NOW IS A HEP S5001
- 28 - TIP 36C - TAPE LIFTED XISTON - NEW ADDITION - ON HEAT SINK
- 29 - TIP 30 - POWER REGULATOR ON BIOLOGY BOARD
- 30 - 02 } LP FILTER
- 31 - 04 }
- 32 - 02 } - PREAMP FOR PHOTO XISTON
- 33 - 02 }
- 34 - 04 } - COINCIDENCE COUNTER
- 35 - 4 }

IC-1

A1

LED DIODE + PHOTOTRANSISTOR
ARRAY

SENSOR TECH STRT 850A
(MODIFIED)

PLAY

DEAD
STOPMOTION
TO STOP

F.F.WD

REWIND

20.0

A MOTION SENSE	-24V	0	-22.00	-22	-22	0V
B "REWIND"	-27.2	-27.3		-26.5	-1.0	-27.3
C B-	-27.2	-27.3		-26.5	-26.0	-27.3
D "LOAD"	-27.2	-27.3		-26.5	-26.5	-0.8V
E "FAST FWD"	-27.0	-27.2		-1.0V	-26.0	-27.3
F SERVO IN	-3.0	0V		-7.0V	-1.3	0V
G COL Q16	-26.5	-37.3		-6.0V	-20.0V	-37.3
J BASE Q16	-1.6V	-0.09V		-3.2V	-0.48V	-0.09V
K B-	-27.2	-27.3		-26.4	-26.2	-27.3V
L GND						
M E Q16	-0.7	0		-1.6V	0	0
N ANTICLAMP	-17.5	-17.6		-17.0	-17.2	-17.0
P SERVO WATT	-29.7	-36.2		-17 to -27	-17 to -27	-37.3
R COL Q22	-29.7	-35.8		START -18 to -46V	-6 to -16	-37.3
S ATL	-0.3	-0.3		-25.8V	-25.8V	-0.3
T BASE Q22	-0.6	-0.6V		-0.5V	-1.0V	-0.3
U GND						
V P.R. CLAMP	-27.0	-23.4		-22.7	-22.7	23.4
W PRE	0	-26.6		-25.5	-25.5	-26.6
X "PLAY"	-1.0V	-27.3		-26.3	-26.3	-27.3
Y NC						
Z GND						

SERVO
RIGHT CARD
310163
16 TRACK
5-19-75

164 CARD
LEFT CARD

24 TK 4-10-17 (B)
PLAY
~~START~~

RECORD

mc = 8-8 min
SYNC = OFF
PAE = OFF
REW FF

STOP

-2.2V

STO

-2.1V

70 MVPP (1MS)

1	A								
2	(B) CHASSIS								
3	C POS OF TACH WHEEL	-5 to -19.6 pc	-13.7		4VPP (1.2MS)				
4	D	0	-21.3V		.65V 22VPP (500USEC)				
5	(E)	0	-21.3V		20.8 20.8 21.7				
6	(F) CHASSIS no connection	0	0	0	0	0	0	0	0
7	H	0	0	0	0	0	0	0	0
8	J	0	0	0	0	0	0	0	0
9	K	SIG was there then disappeared	0	0	0	0	0	0	0
10	L NC	0	0	0	0	0	0	0	0
11	M	0	0	0	0	0	0	0	0
12	N SAME GINE IN STOP BUT CLEAN	0	0	0	0	0	0	0	0
13	P	0	0	0	0	0	0	0	0
14	R	30V (20MS)	0 [10.7AC]	0	0	0	0	0	0
15	(S)	0.1V	-21.3	-20.8	22V (500USEC)	21.3 21.3			
16	T	-21.3	-25.5	-25.2 (500US)	-21.2	-21.2			
17	U	-22.0	-16.1V	10VPP	-16.1	-21.8	-21.8		
18	V no SIG	-26.3	-25.7	-25.4	-25.1	-25.1			
19	W NC								
20	X	-0.7	-5.5	7VPP (20MS)	-5.5	-9	-9		
21	Y	-15.8V	-15.9	-15.9	-15.8	-15.8			
22	Z	-0.6	-3.4	-3.3	-4.6	-1.2			

The tach wheel has 192 divisions.
 It makes 5 revolutions per in one second
 for 960 Hz output. $192 \times 5 = 960 \text{ Hz}$
DIVISIONS REV.

Reversing idler 1.908" DIAMETER.

5.9942 CIR.

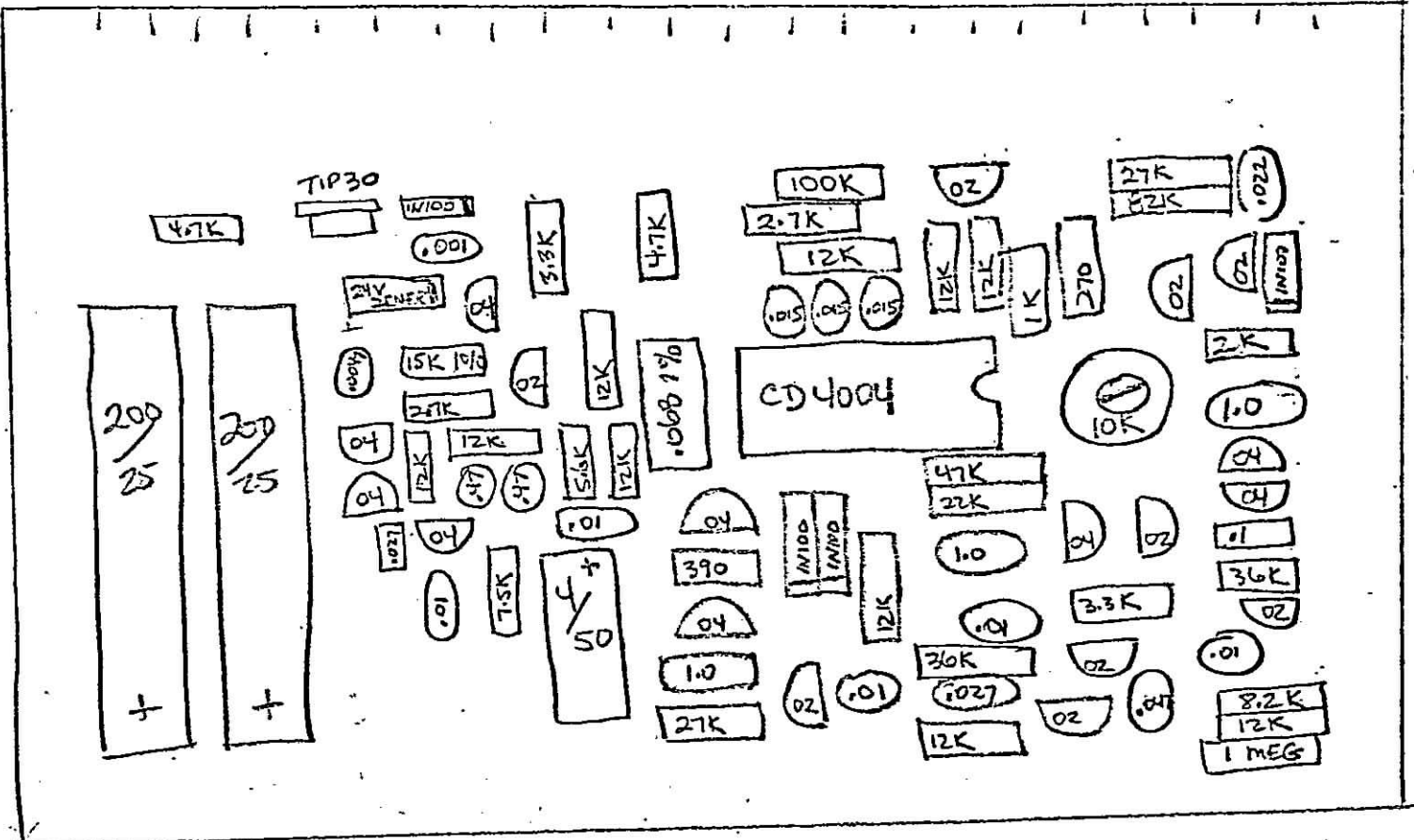
$5.9942 \times 5 \text{ revolutions} = 29.971 \text{ INCHES}$

$960 \text{ CY} \div 2 = 480 \text{ Hz} \div 192 = 2.5 \text{ REV OF IDLER/SEC}$
 14.98555 "/sec

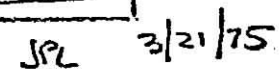
$15 \text{ "sec} \times 60 \text{ sec} \times 3 \text{ MIN}$

$15 \times 180 = 2700 \text{ " for 3 MIN. TUNE.}$

Z SECND IN
 Y- ANT IN
 X OUT
 W
 V- 27V
 U- SPEED
 T- PRE
 S 9600 IN
 R- 6042 IN
 P DET IN
 N EXT SYNC
 M INT SYNC
 L EXT SYNC
 K SCANNIR
 J SPEED IR
 H SCANNIR
 F GND
 E 9600 OUT
 D SPEED
 C TAPE
 B- GND
 A- LED



310164

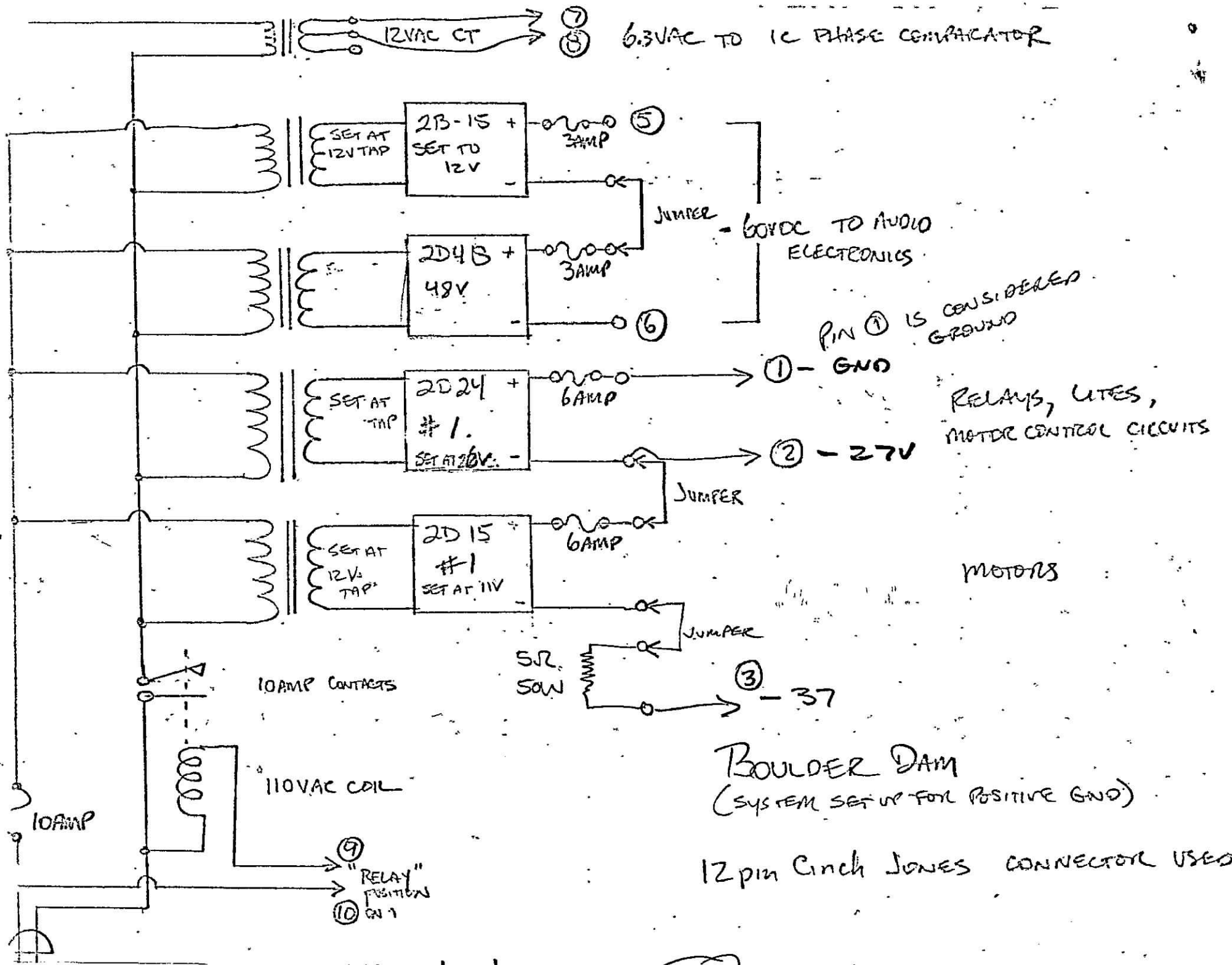


310163 SERVU

OLD BOARD WITH ALL UPDATES

A - MOTION SENSE
 B - REWIND
 C - B-
 D - LOAD
 E - FIRST FWD
 F - SERVO IN
 H - TAKE UP MOTOR COL Q16
 H - BASE Q16
 K - B-
 L - GND
 M - EMIT Q16
 N - ANTI HUNT
 P - SJC SOWATT
 R - REWIND MOTOR COL Q22
 S - TAPE LIFT
 S - BASE Q22
 T - GND
 V - P.R. CLAMP
 W - PRE
 X - PLAY
 Y - N.C.
 Z - GND

SERVO
 CARD
 RIGHT
 310163



6

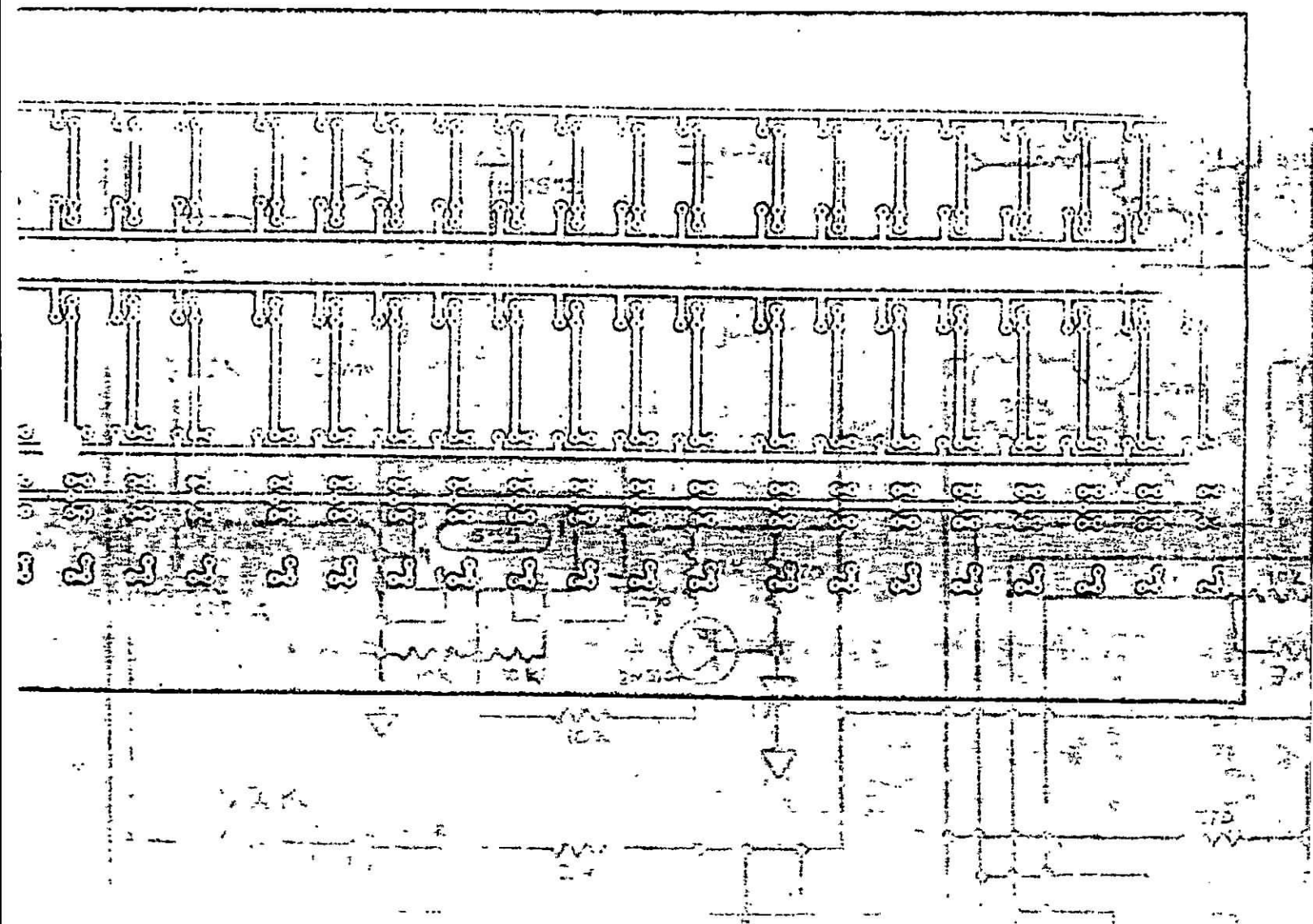
CE ITH 1.2K

OR

NITS ONLY

24 TRK MULTIPLEX LOGIC BOARD (REAR)

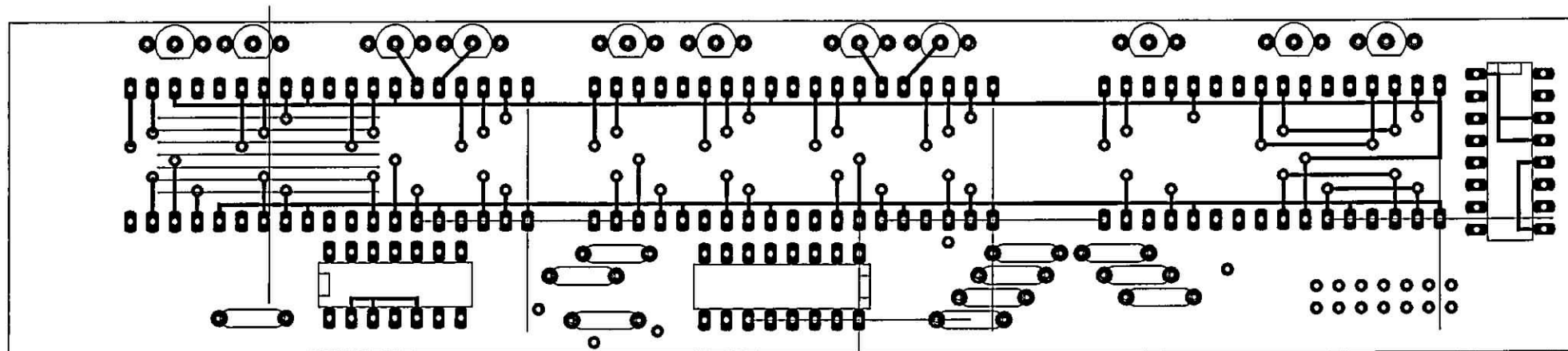
ONTROL FEED TO LINE AMPS

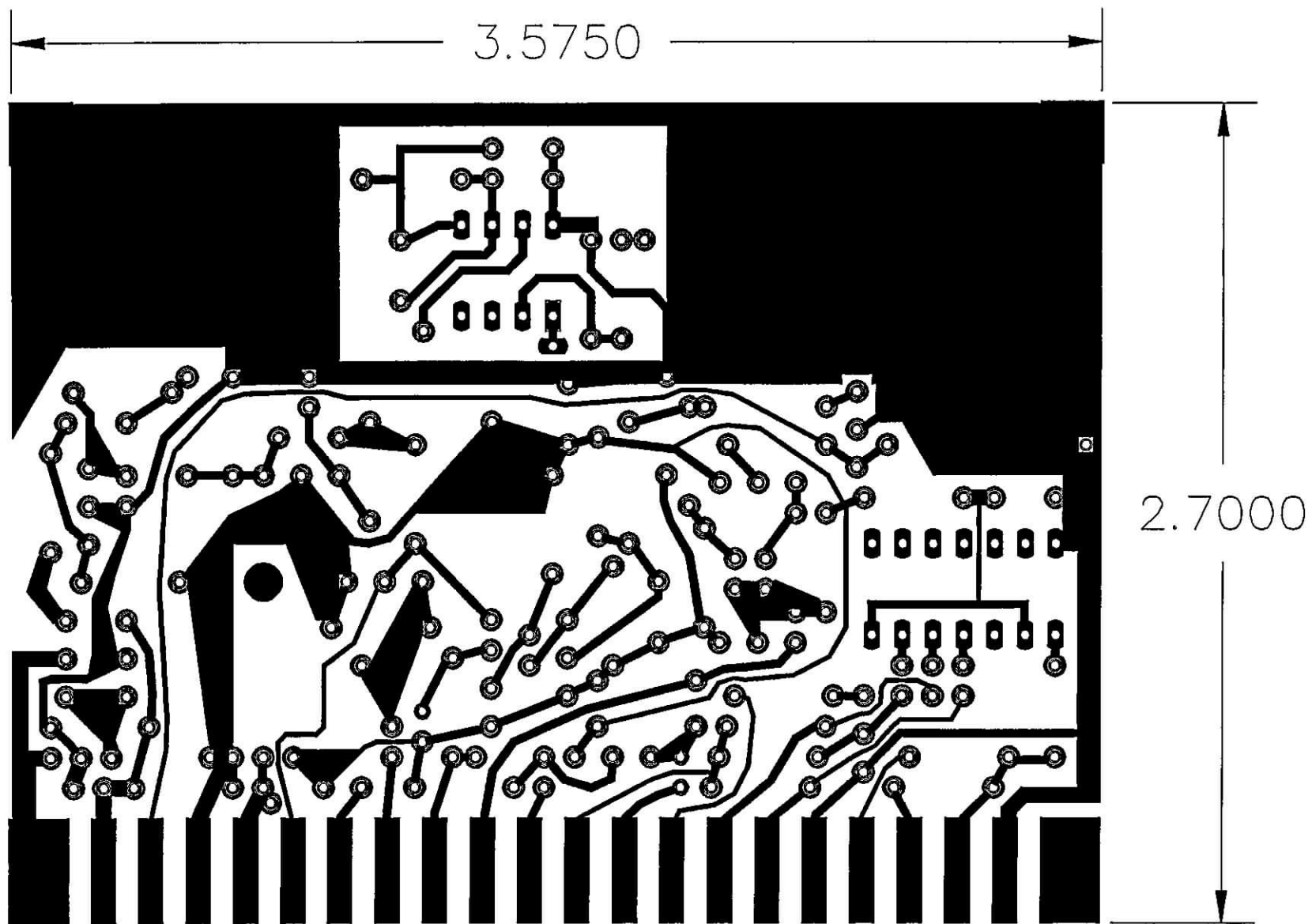


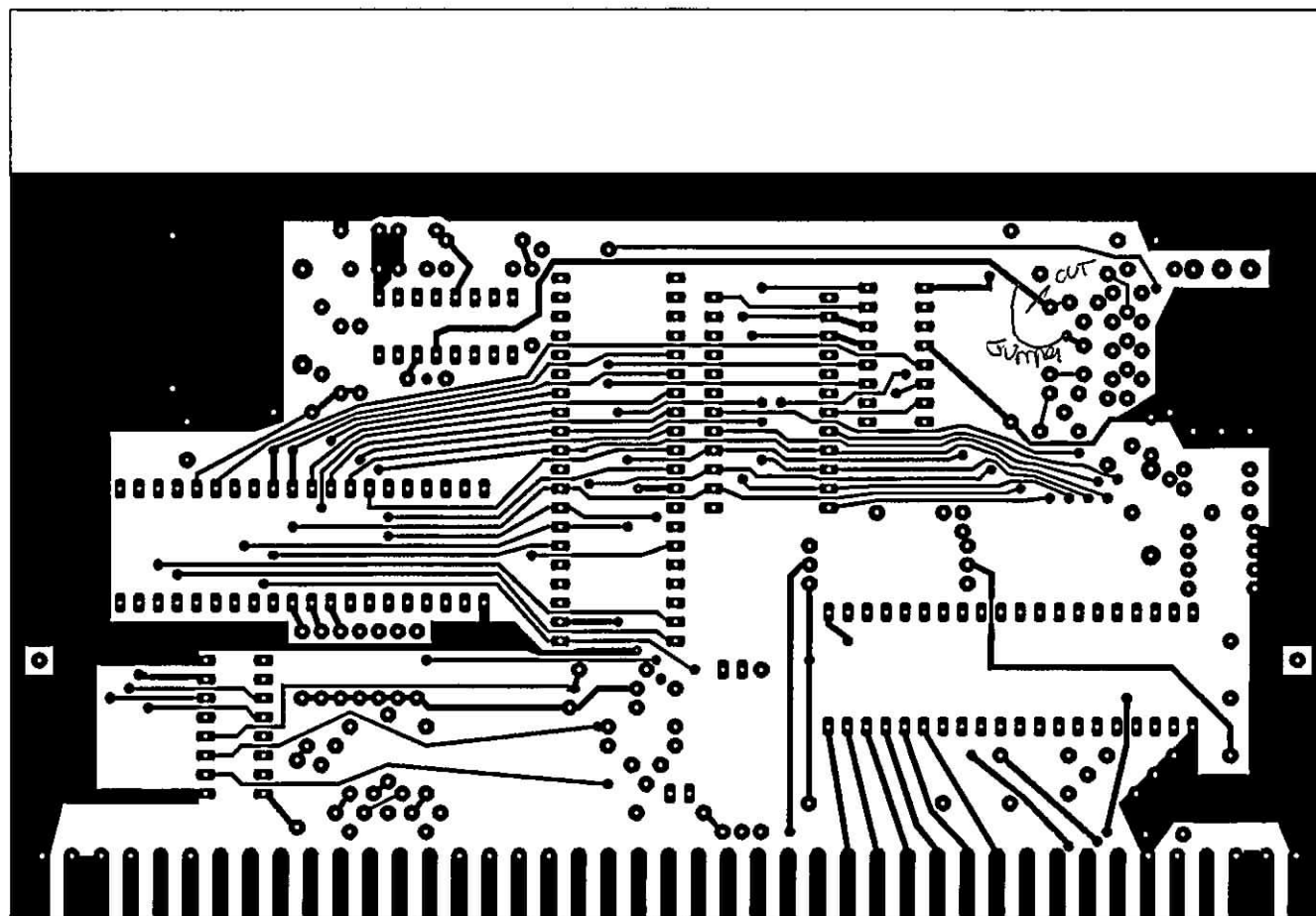
4/8/76

RANDY

One out two pines

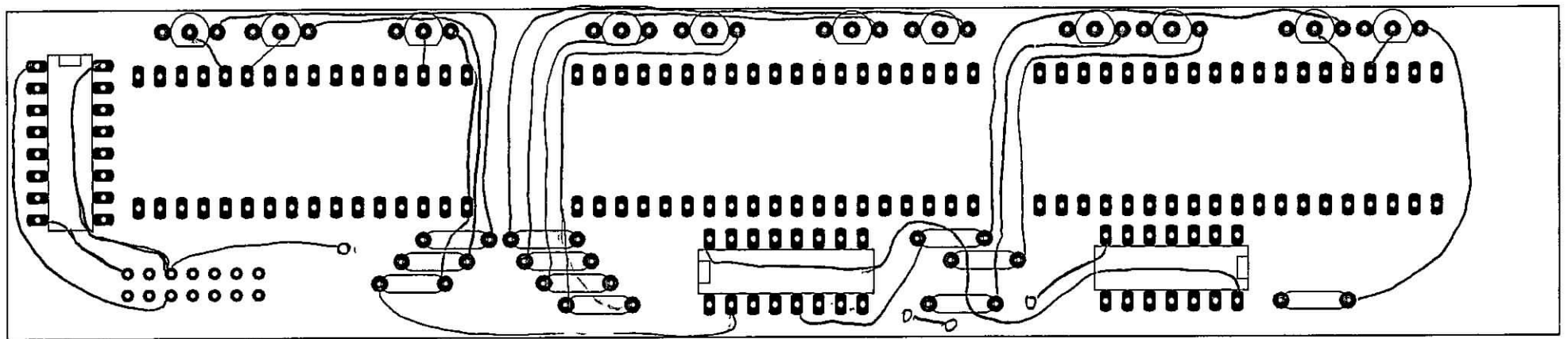


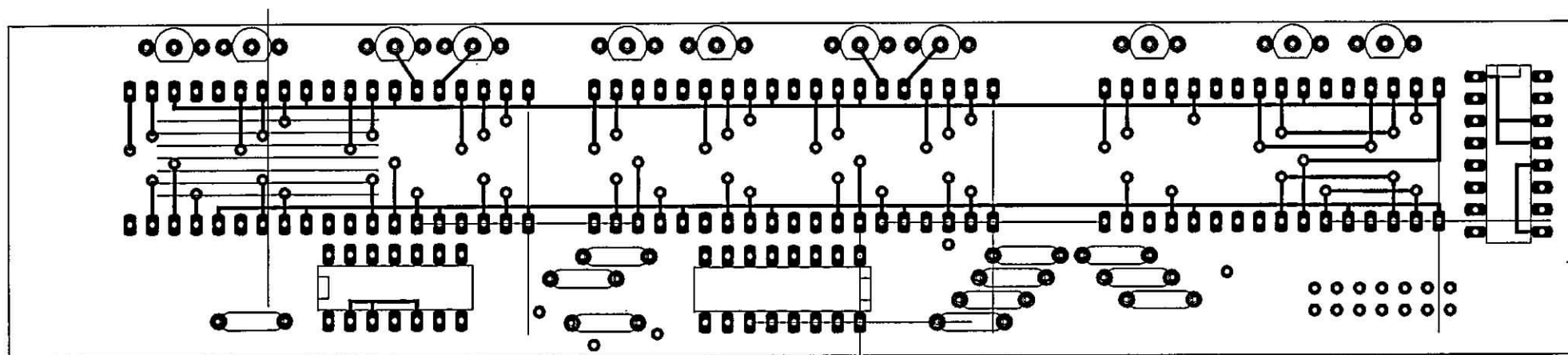


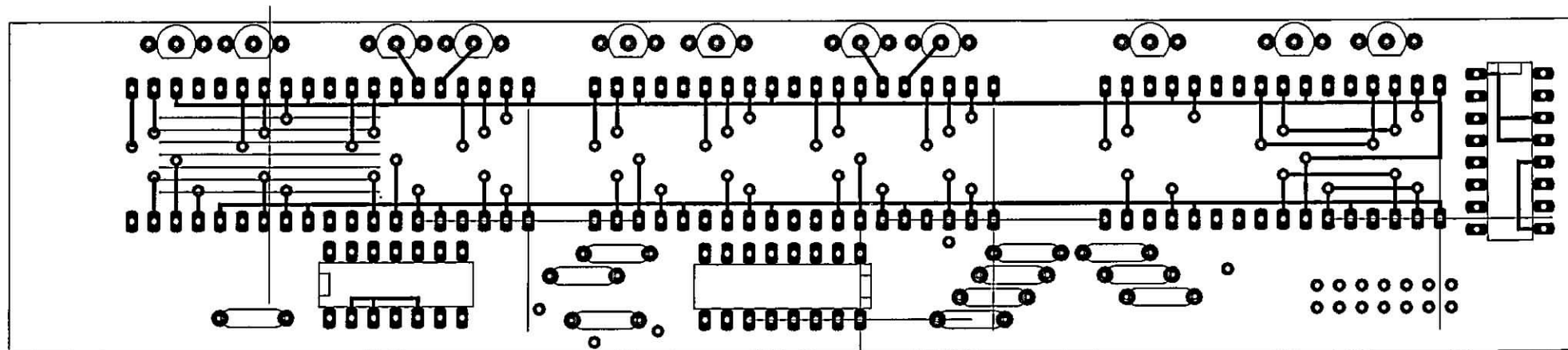


comp side

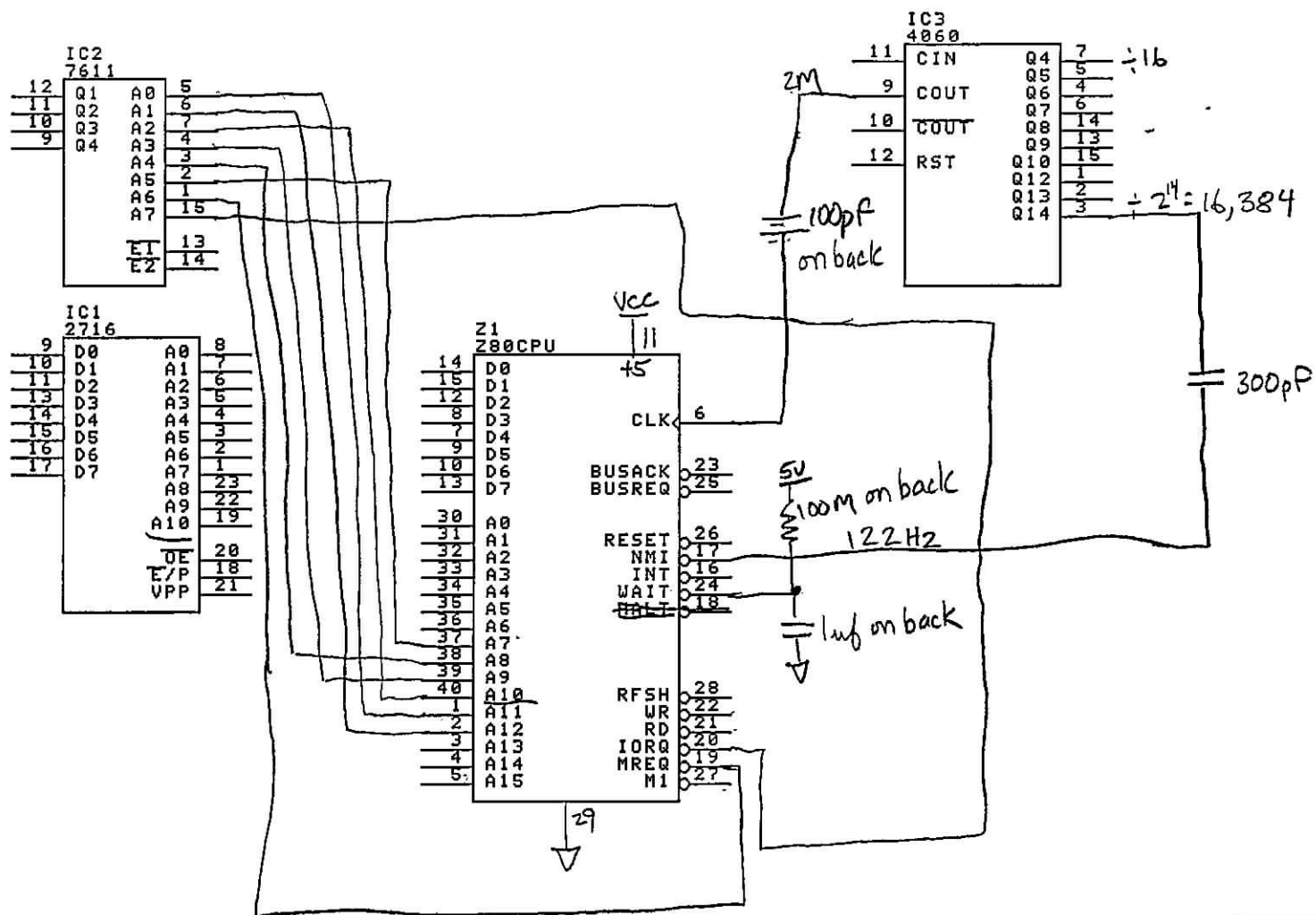
front



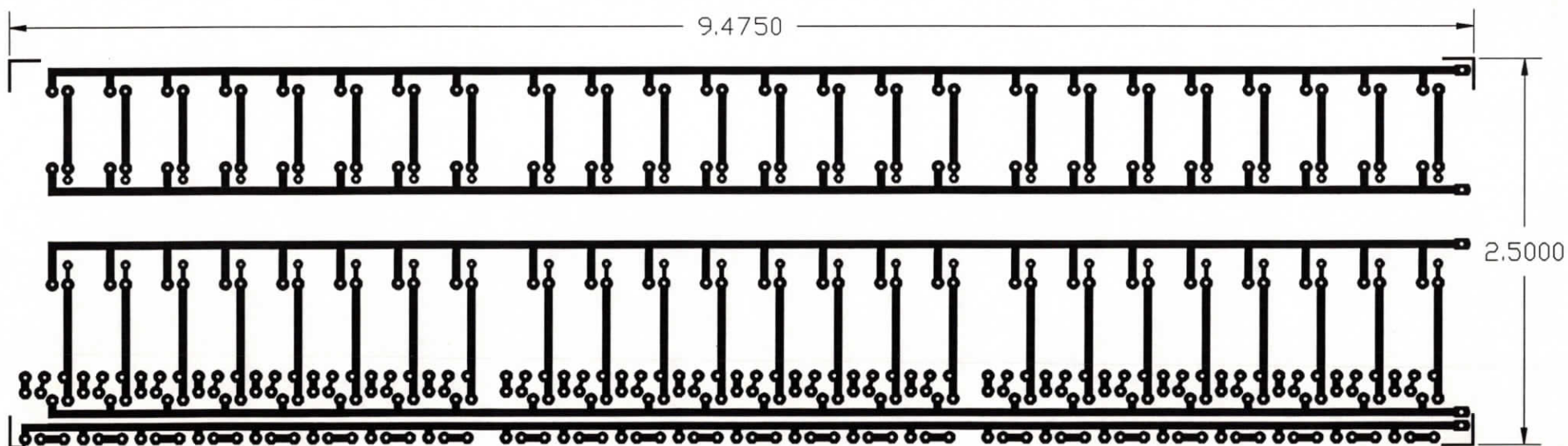




1,85
.85

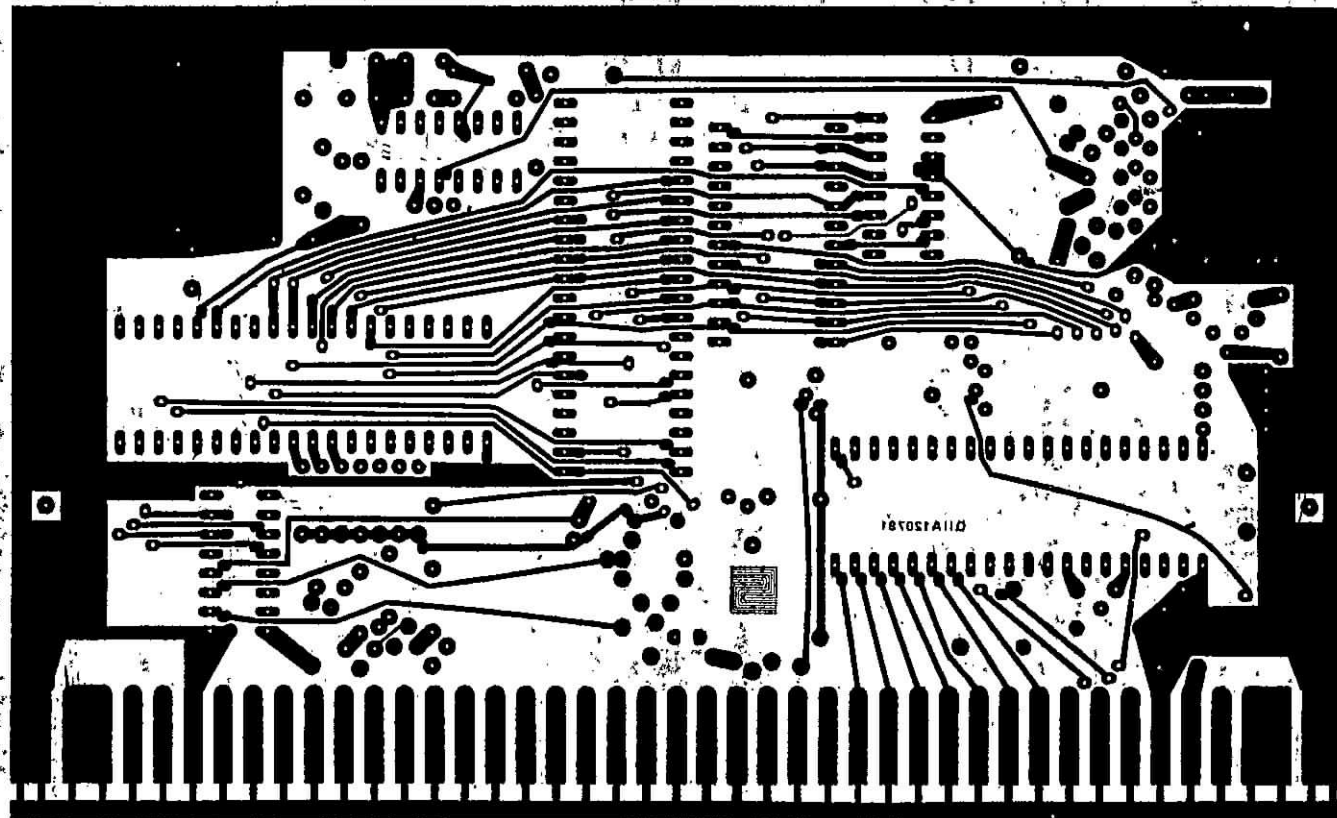


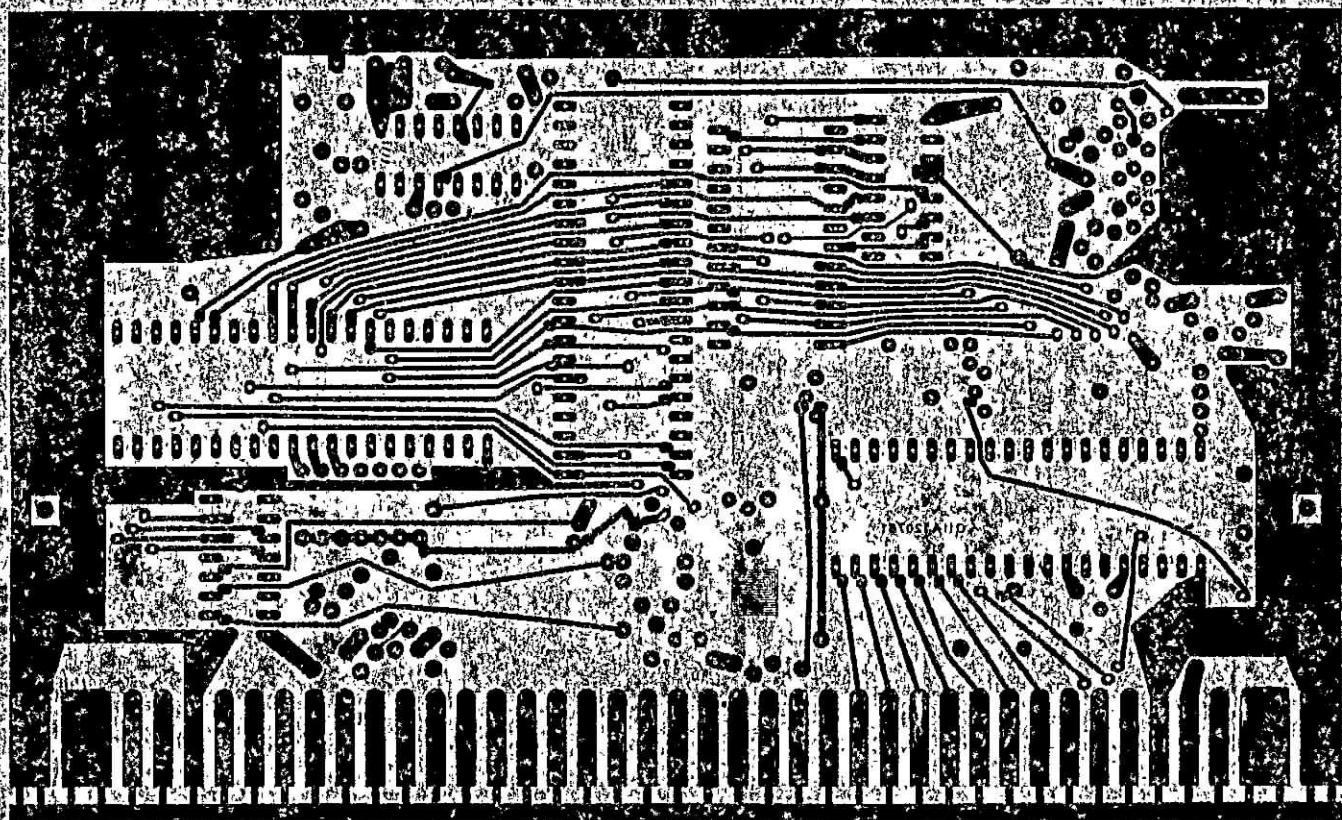
Title		
Size	Number	Revision
A		
Date: 24-MAR 1990		Sheet of
File: ST_COMP/1		Drawn By:

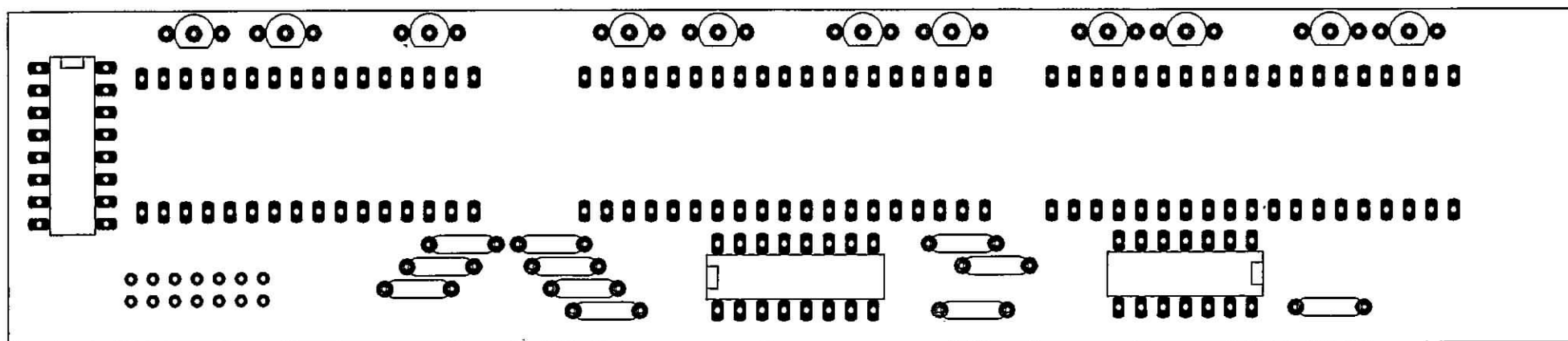


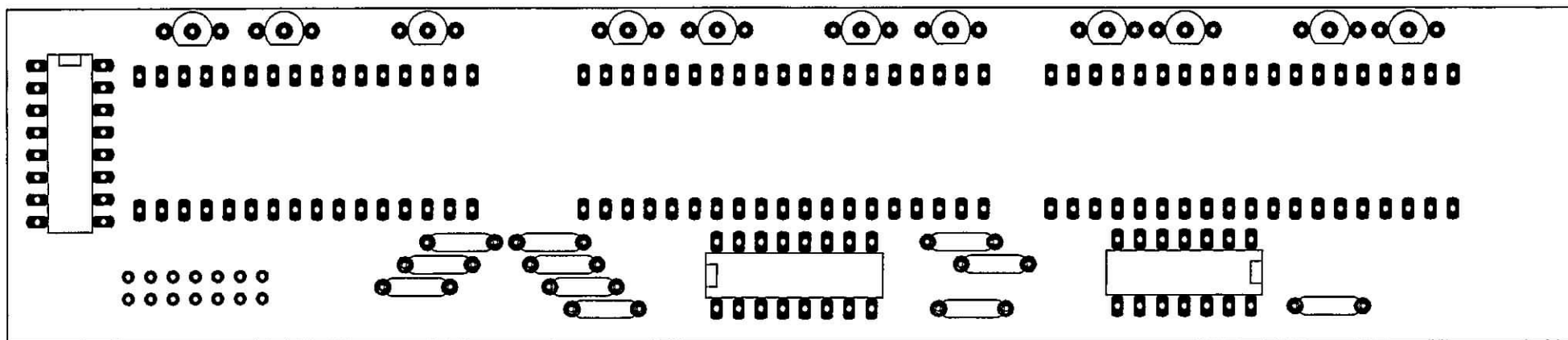
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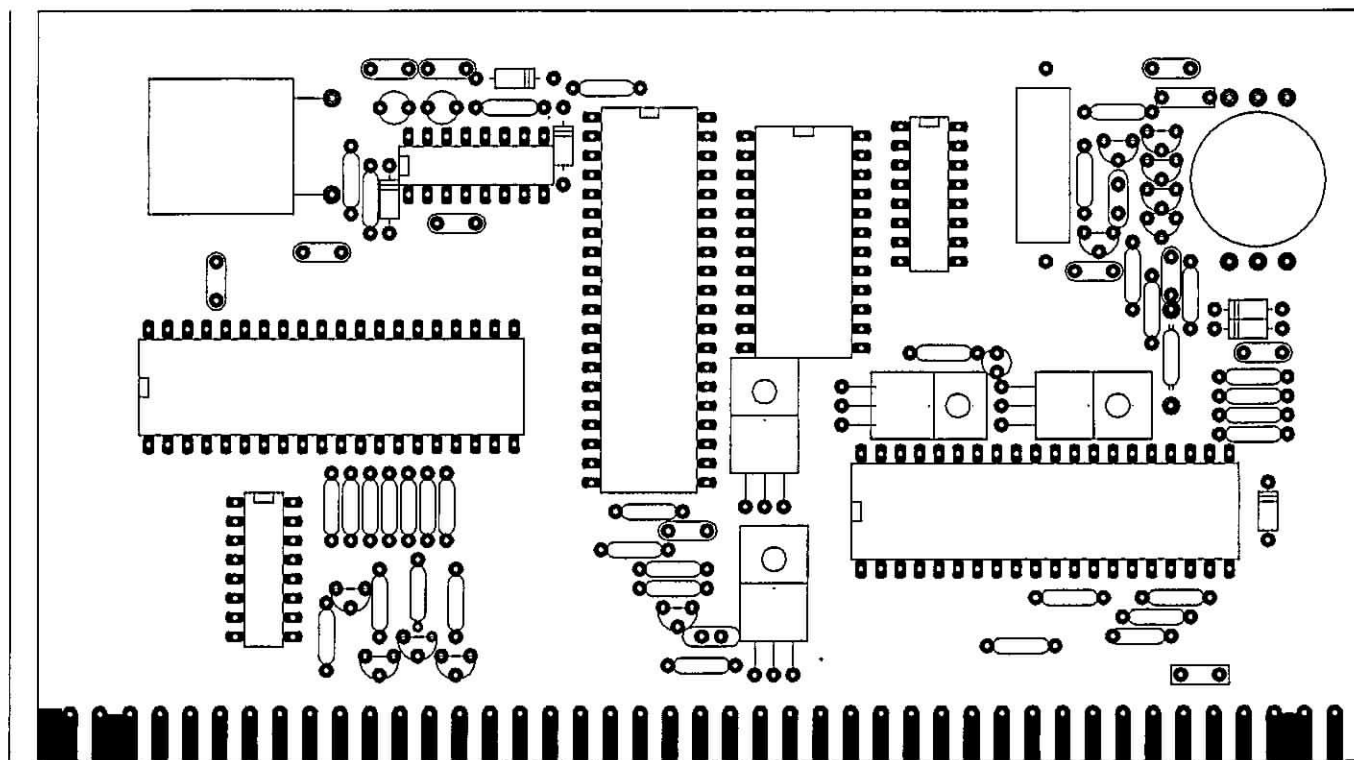
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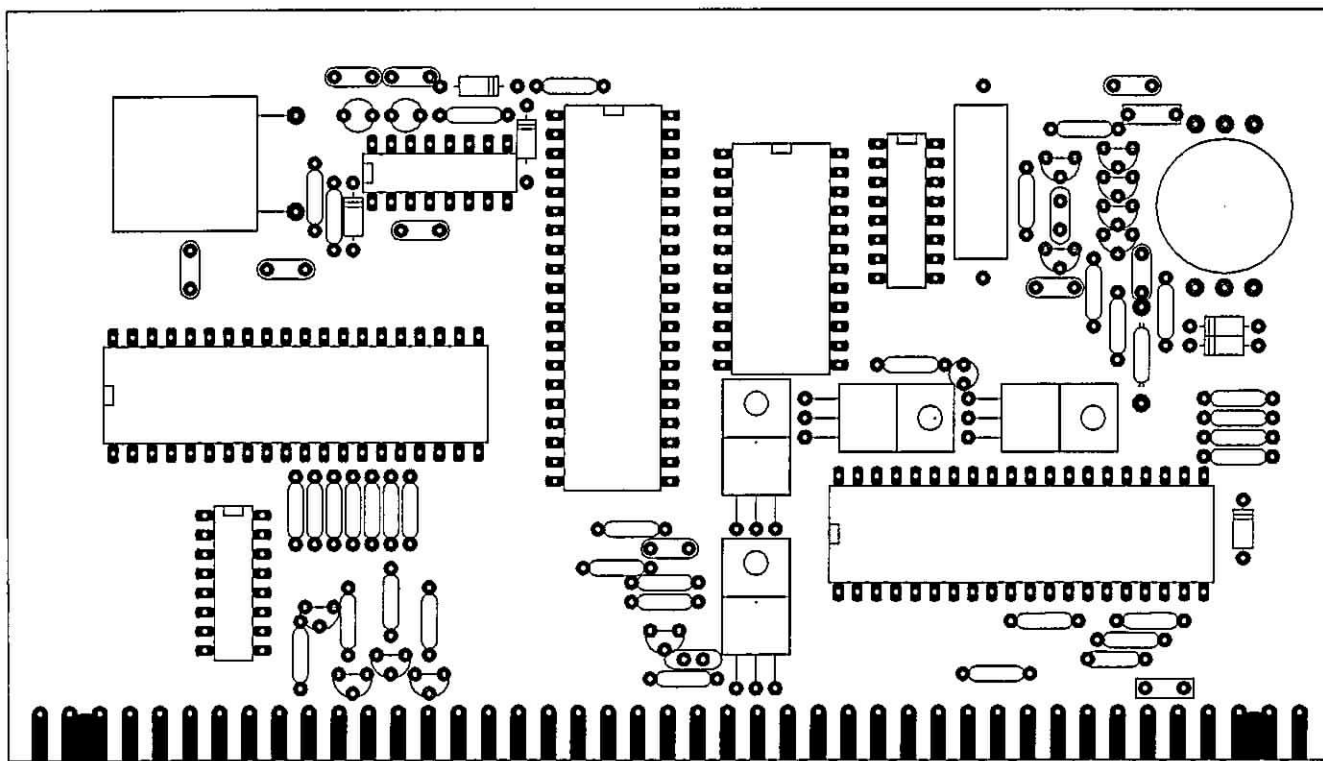




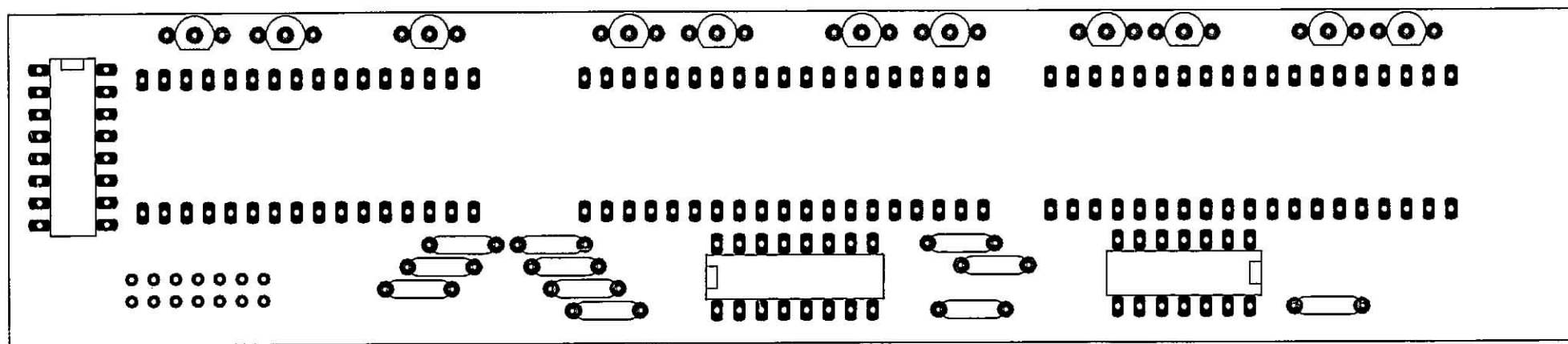








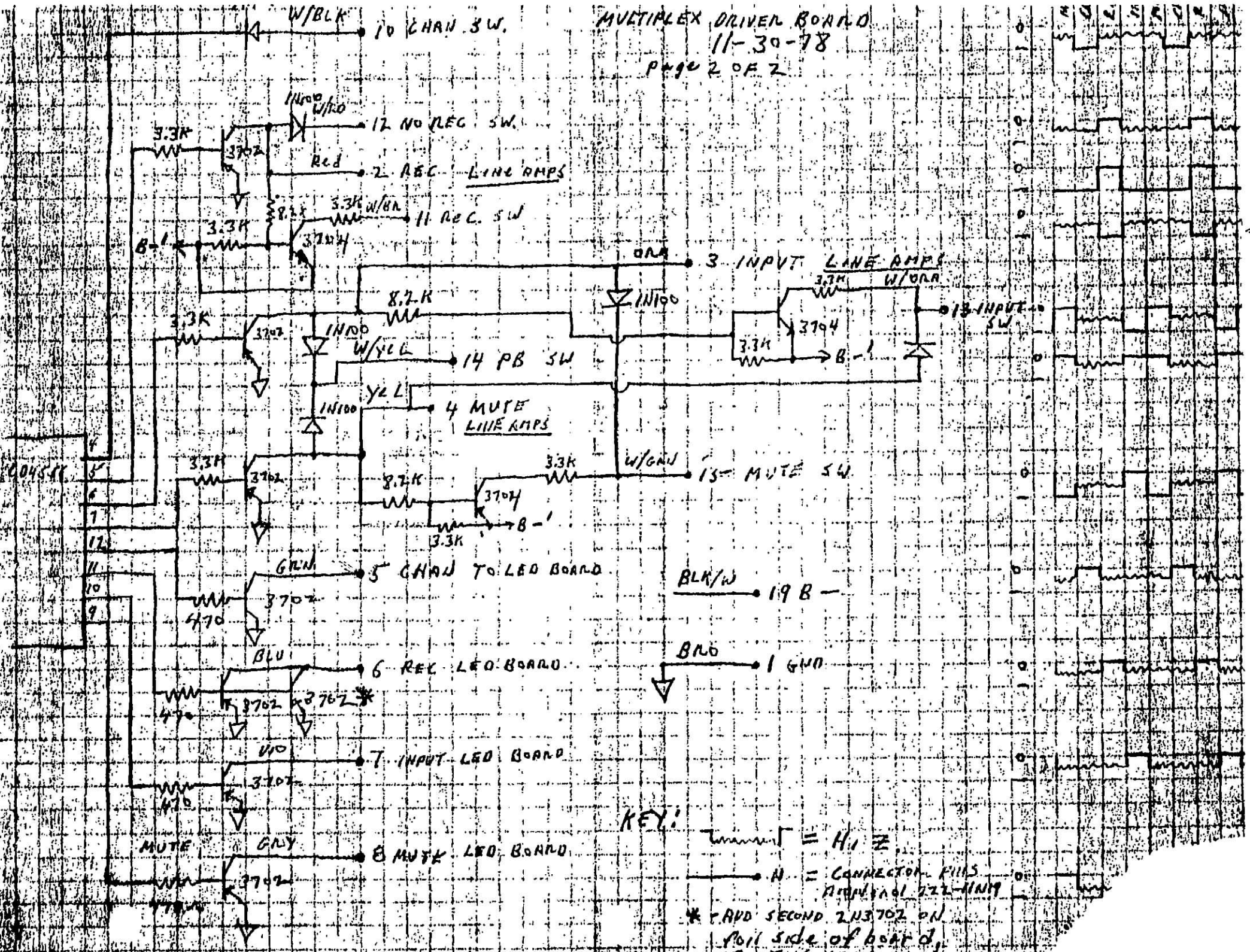
2.65
1.35



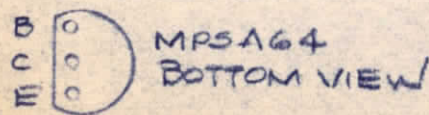
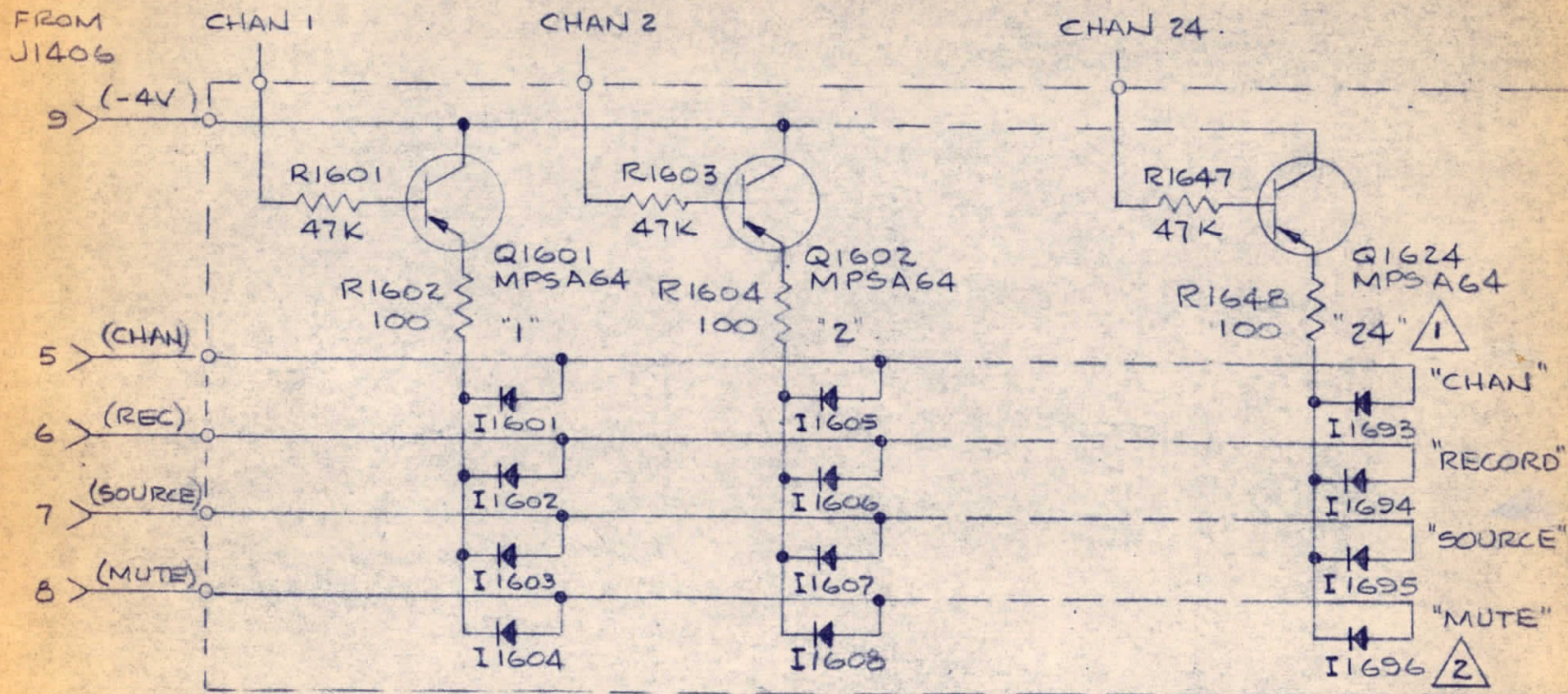
MULTIPLEX DRIVEN BOARD

11-30-78

PAGE 2 OF 2



REVISIONS			
LTR	DESCRIPTION	DATE	BY



LED CARD UNIT SERIES CONTINUES INTO 1700'S FOR 32 & 40 TRACK.

24 TRK VERSION SHOWN. LAST NO. CORRESPONDS TO NO. OF TRACKS

STEPHENS ELECTRONICS, INC.

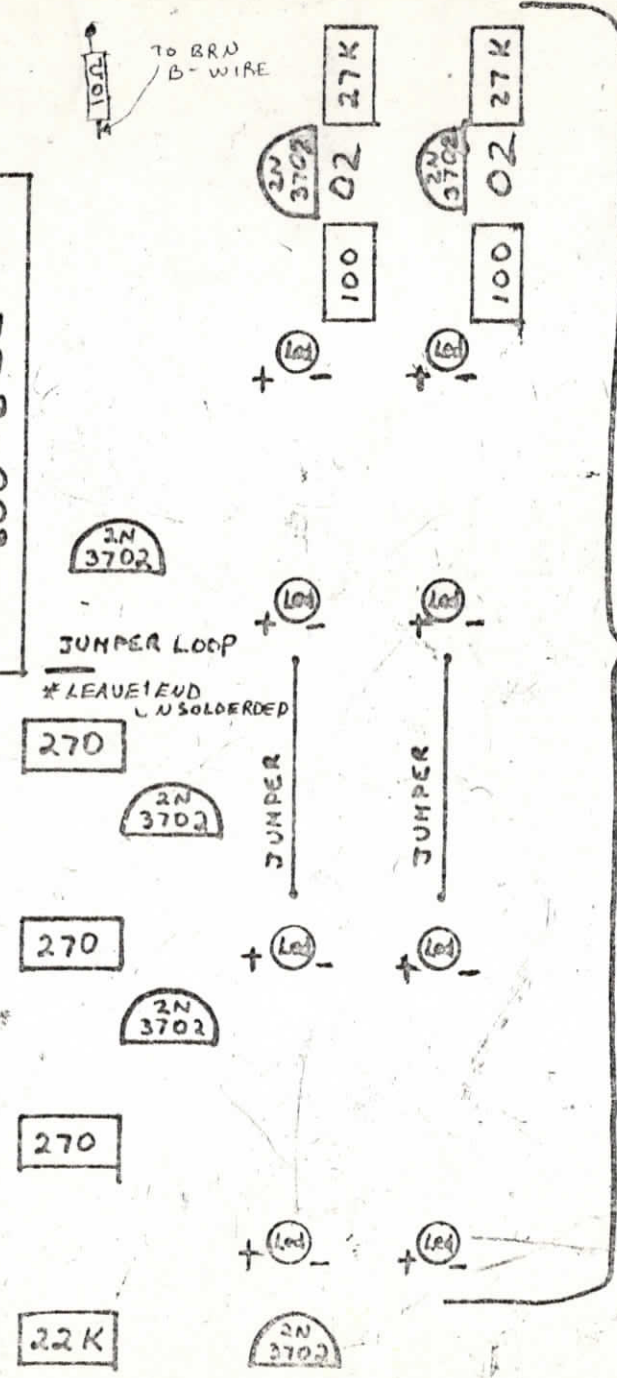
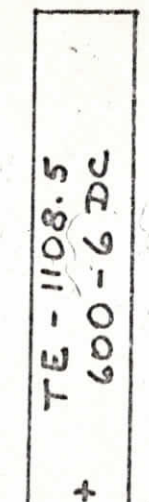
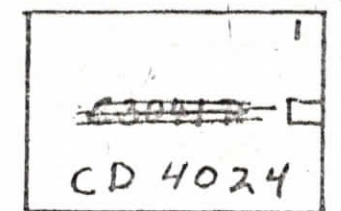
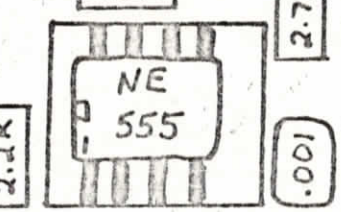
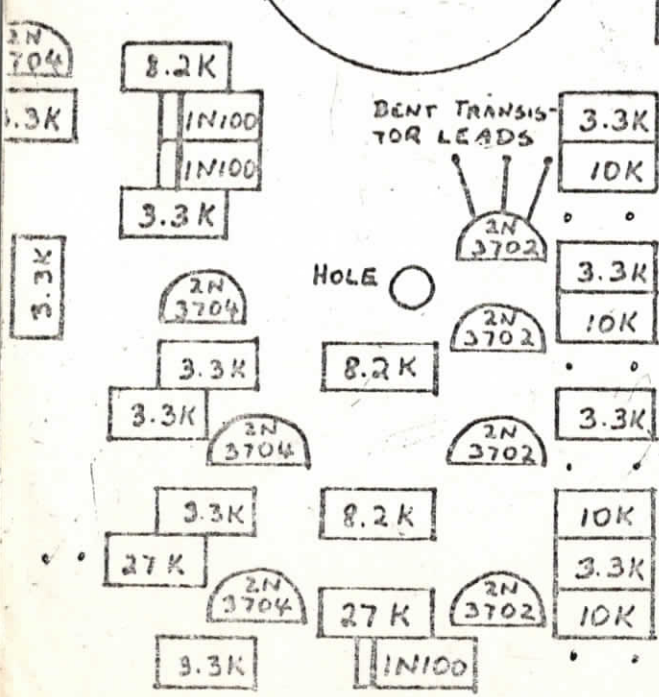
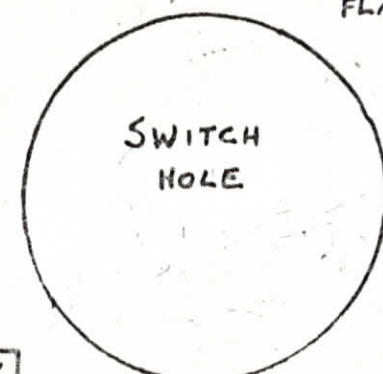
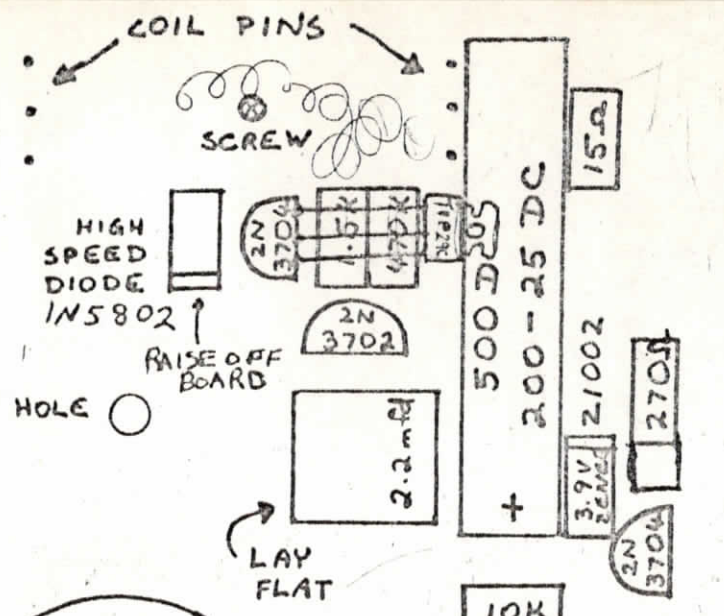
SCALE: \sim	APPROVED BY:	DRAWN BY: GEIER
DATE: 22 OCT 79		REVISED

LED CARD

MODEL 821-B	FIGURE 6-14	DRAWING NUMBER SC1601
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24 TRACK MULTIPLEX LOGIC CARD

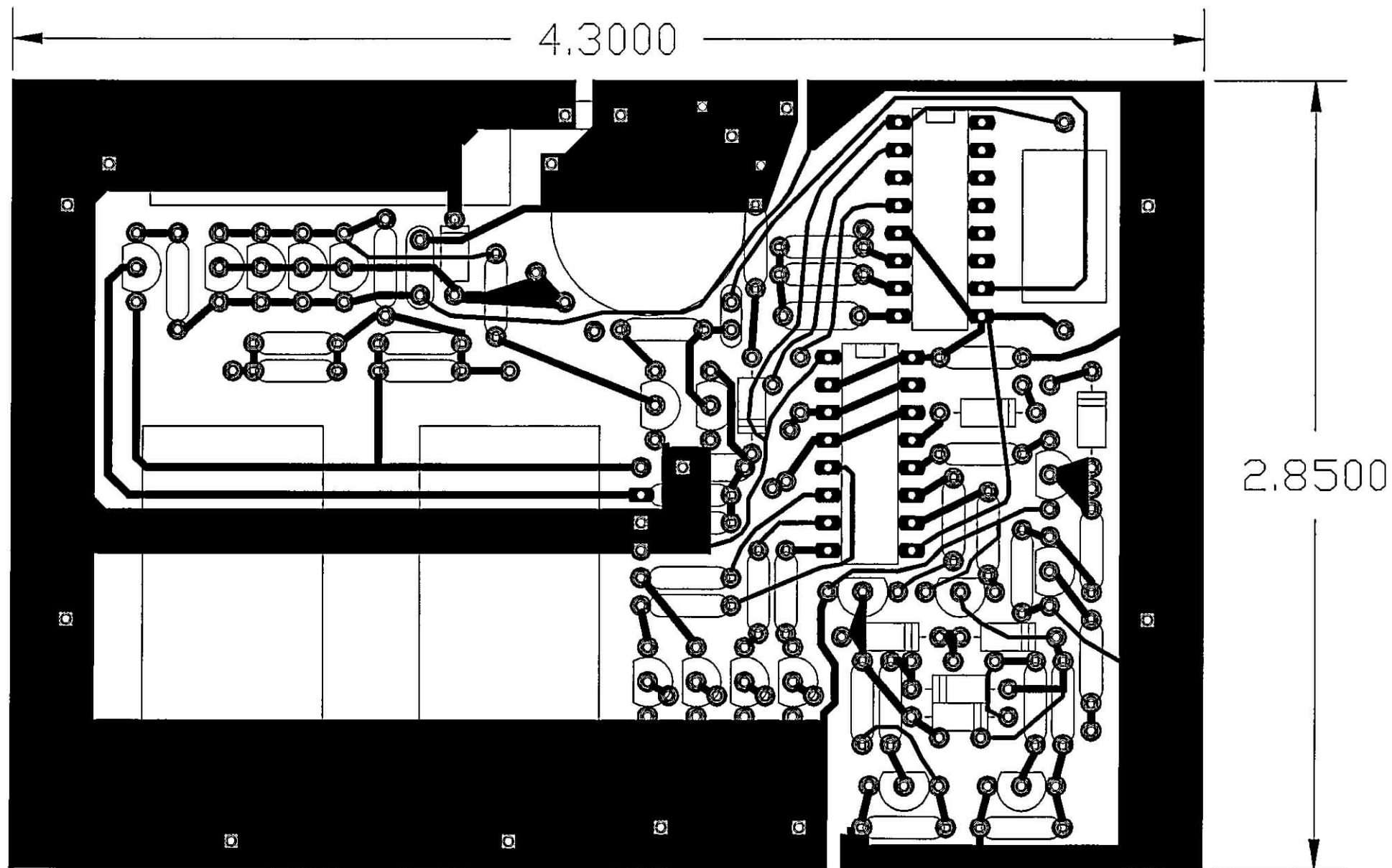
D-387
 PLDD-387
 LAYERS (2) OF
 MYLAR
 TAPE
 COIL 175
 TURNS OF
 NO. 26
 RE

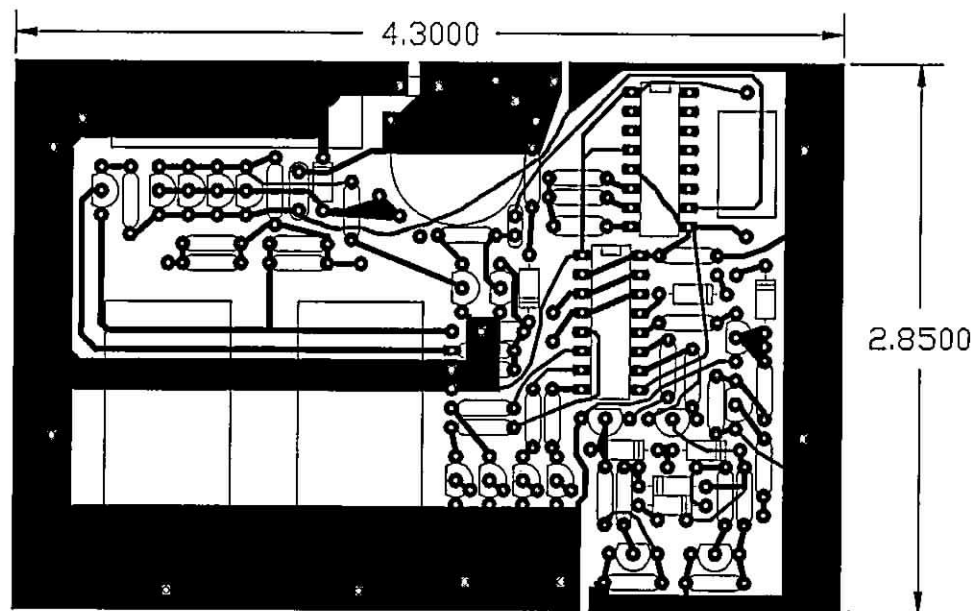


CONTINUED FOR 1-24 CHANNELS

4/8/76

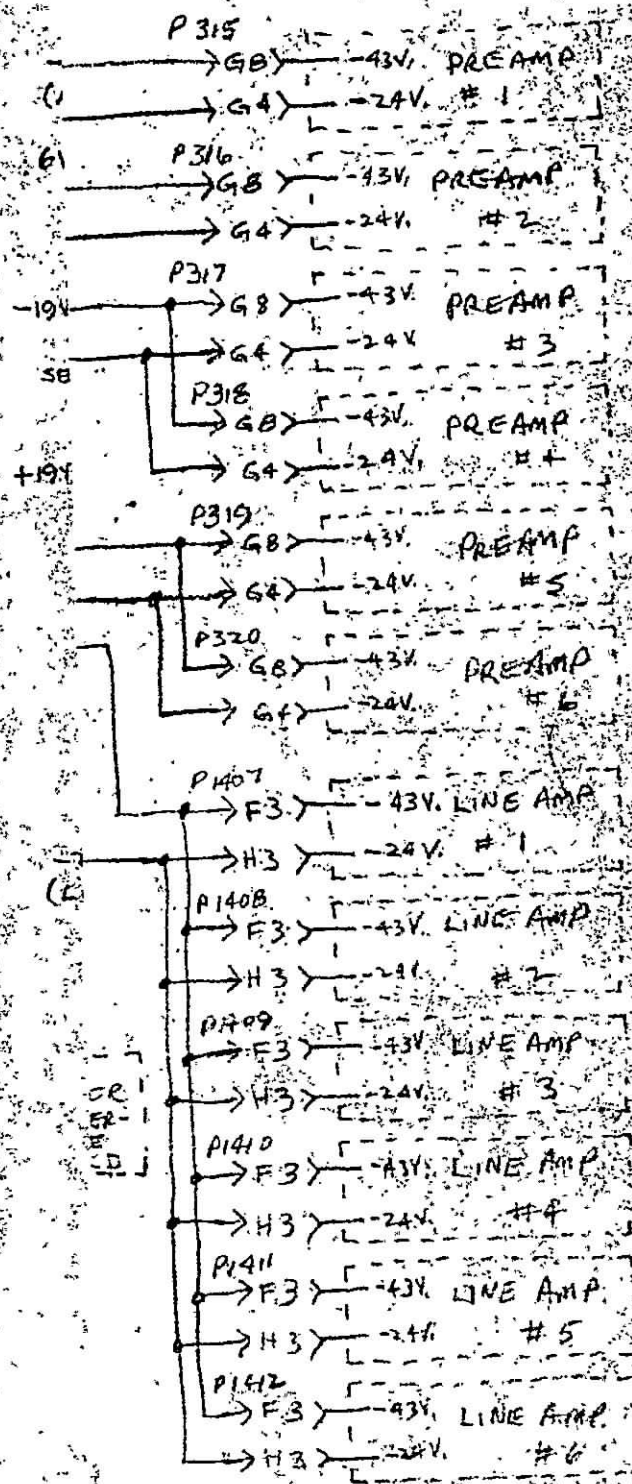
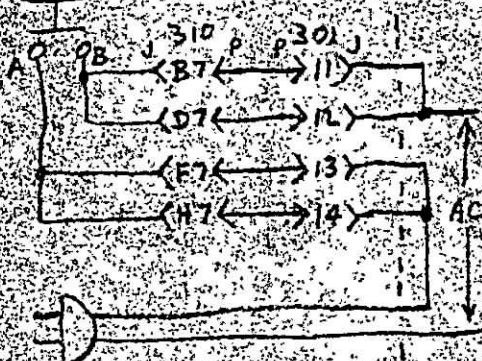






S401
P300

POWER SU



TIC, POWER DISTRIBUTION SYSTEM

FIGURE 6-4

SC-0004

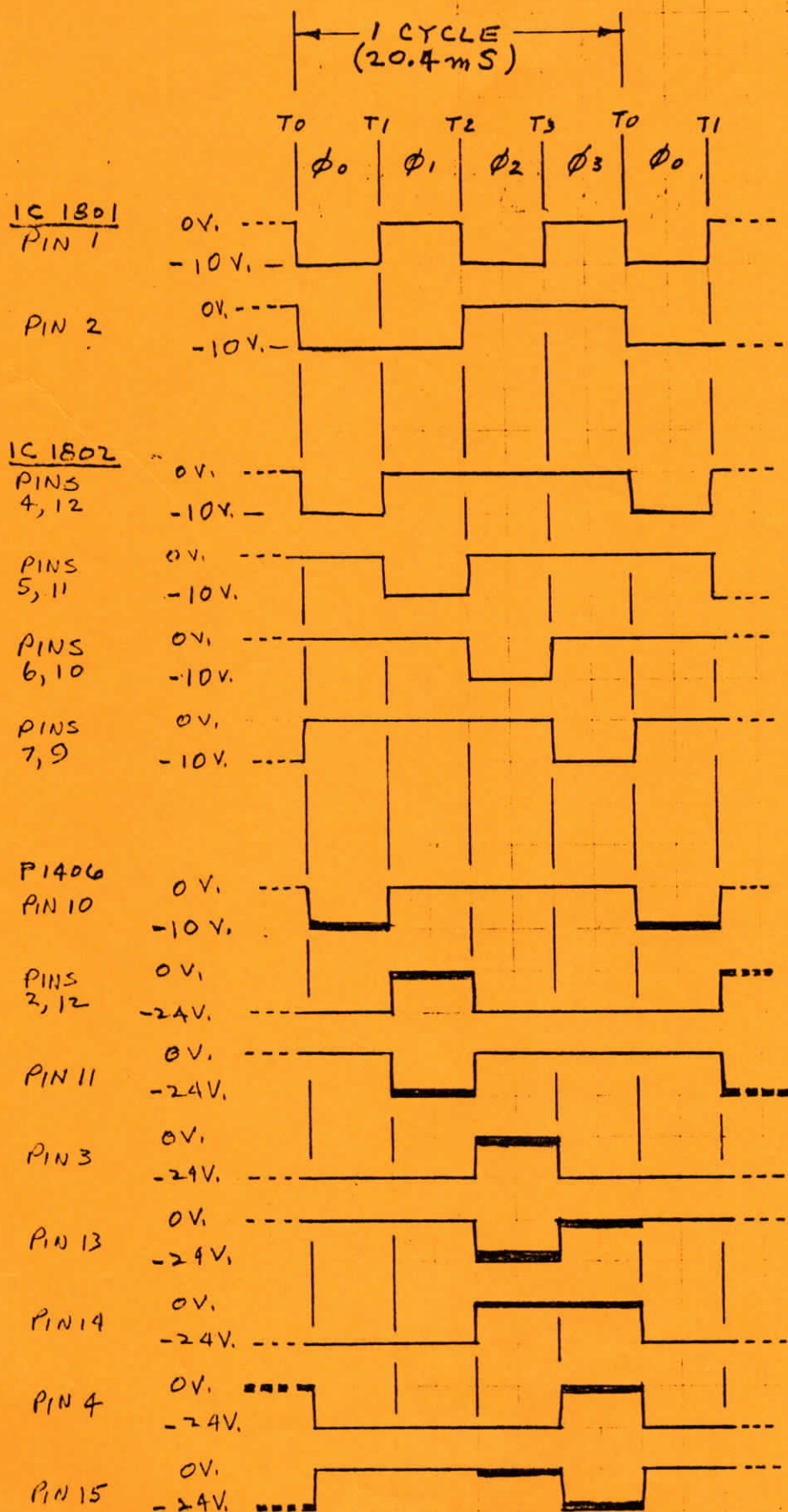
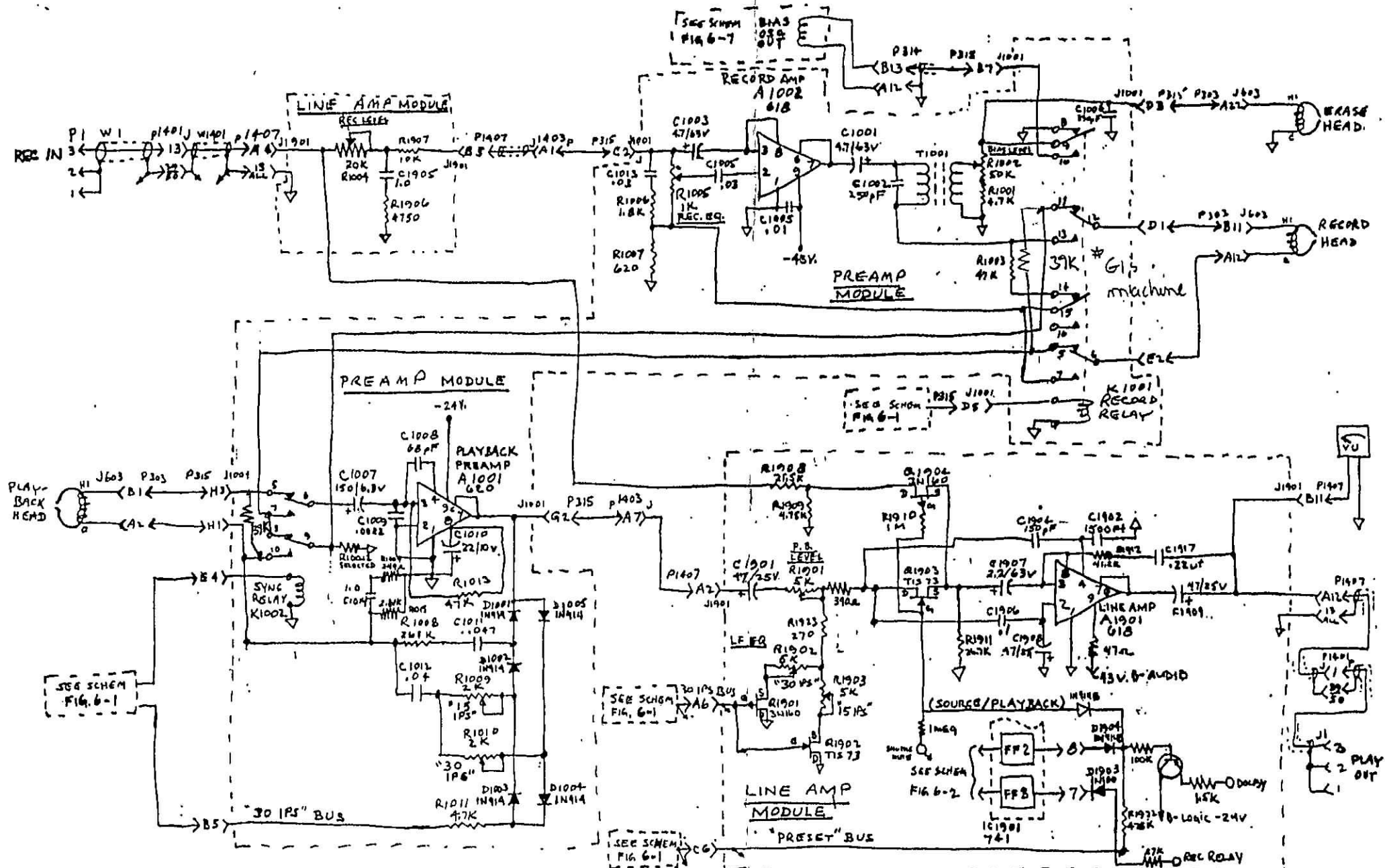


Figure 4.6-2. Multiplex Timing Diagram. 77



SCHEMATIC, RECORD AND PLAYBACK SYSTEM
FIGURE 6-3

SC-0003

7/30/79 PB REV 6/1/82

When CROPPING INCLUDE A SMALL LINE OF CLEAR EMULSION ON ALL 4 edges.

+

LOOK AT PAGE 3-6 OF YOUR MANUAL

READ "DPI" Therefore, UNDERLINE please

Width & Height DON'T MATTER DO NOT LOCK

USE DPI + ZOOM TO SET YOUR FILE SIZE see 4-12 + 5-2

see Page 3-16 SETUPS

3-20 ADAPTIVE LIGHT - Histogram

3-22 - USM (UNSHARP MASKING) DO NOT APPLY

3-24 color correction - NO

3-26 AUTO TAB - NO

Keep CAST BUTTON ✓

3-28 DOT TAB - endpoints, Roundoff; 240 for Highlights, 0 for shadow

3-29 MONITOR -

3-38 HISTOGRAM WINDOW

3-44 LATER I would like to try shadow depth tests

4-17 TRUE OPTICAL RESOLUTIONS 60 X 60mm 3200 DPI MAX

NO X

ADAPTIVE LIGHT - YES

ENHANCED SHADOW DETAIL - YES

ONCE SETUP IS COMPLETE, click on NEW button.

+ save it with a name. pg 3-16 + 3-18

TRY RGB humlike

USE RGB standard

SCRATCH ON FILM 6611

TRY! 320 DPI
10" X 10"

TO SPLIT RGB INTO YB

ALT I + M IMAGE + MODE + MULTICHANNEL

ALT W + L + H WIN + CH + CHANNELS

MOVE #3 TO TOP

TRASH #1 + #2

ALT I + M + GREYSCALE

2400 X 2400 X 3 = 17.28 M = LATEST 6611

4100 X 4100 = 16.81 M

5,61 5,70

TRUE OPTICAL RESOLUTIONS {
3200 X 3200 = 10.24 M
3200 X 3200 X 3 = 30.72 M
1600 X 1600 X 3 = 7.68 M

2.14 2.15

2.11 2.17

8000 PIXEL CCD

100 33Z ~ 14. 1/8W 03

50 ECU - 5TH 105KBB 1,33

Hs1

13MHZ

I ① 36, 1 19-2/36, 1

I ② 36, 2 19, 6

I ③ 3 36, 3/1, 3

O ② 1, 2

DLV 19, 10/11

INVERT → TO, 2 → A12 HOR OUT

JACK

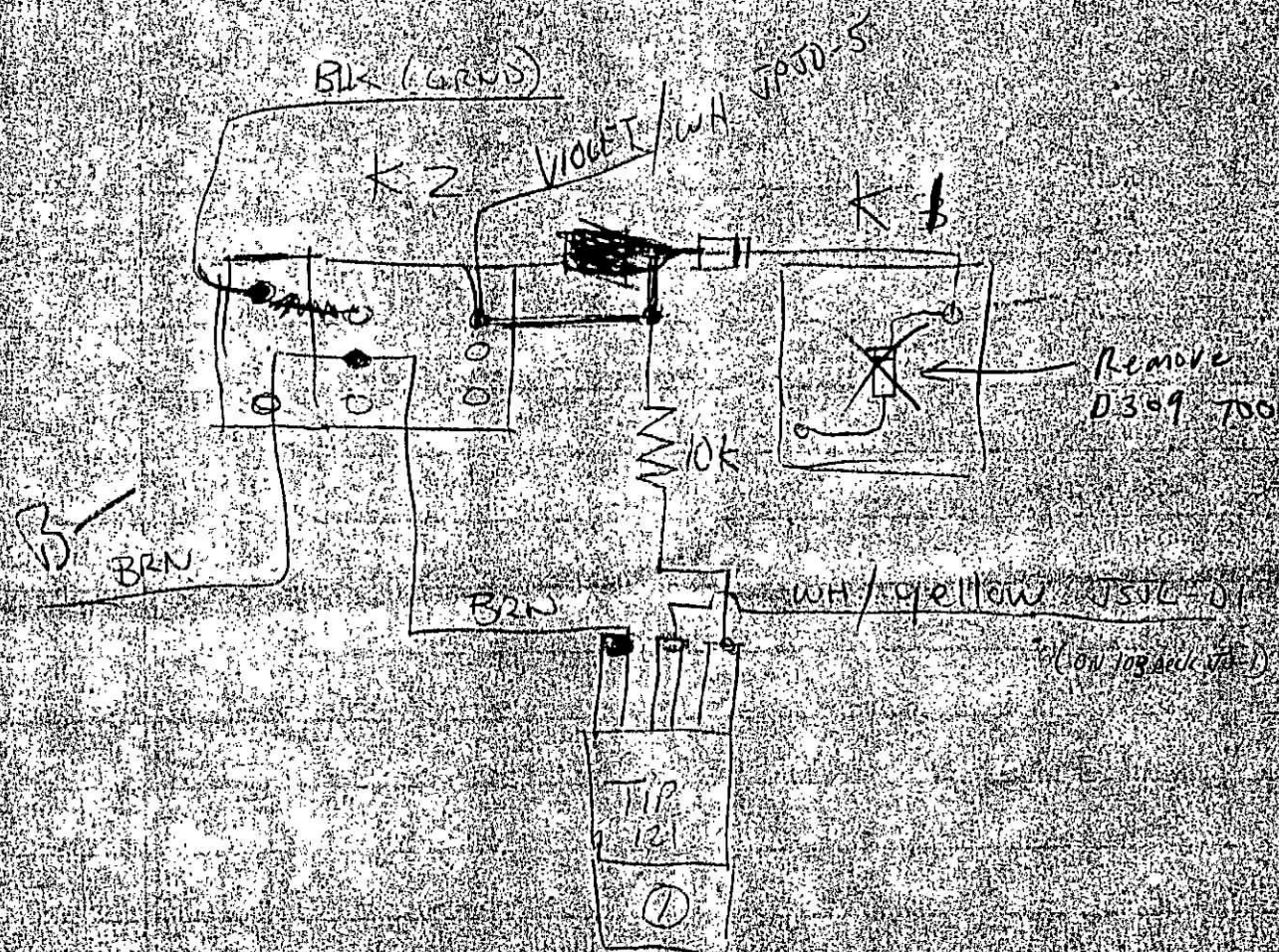
E:\NASA\APOLLO11\2406611

611BY28A.TIF 2065 X 1669 DOUBLED

= 4130x

611BY28B.TIF Cropped -

C:\ACROBAT\Read16\ACRO16.EXE





STEPHENS ELECTRONICS, INC

3513 PACIFIC AVENUE, BURBANK, CALIFORNIA 91505

PHONE: (213) 842-5116

SENSOR ALIGNMENT

For the following procedure, the operator should be knowledgeable about the use of an oscilloscope. Be sure to ground the scope to the chassis of the machine before starting the alignment procedure.

1. Remove head shield carriers to get access to sensors.
2. Center SYM and 90 SYM pots.
3. Connect scope to TP 6, and set for .02 volts/div., internal positive trigger.
4. Rotate BAL pot fully clockwise. With tape loaded, and deck in play mode, adjust Sensor 2 for maximum amplitude with minimum amplitude variation.

WARNING: Use extreme caution when adjusting sensors not to hit the encoded disk. Hitting the disk with a screwdriver or the inner surface of the sensor can cause permanent damage to the disk.



5. Rotate BAL pot fully counter clockwise. With the same above conditions, adjust Sensor 1 for maximum amplitude with minimum amplitude variation.

When completed, both sensor assemblies should be pointing toward the center of the drum shaft.

6. Center BAL pot. Rotate Sensor 1 and BAL pot for minimum amplitude on scope. Increase gain of scope for accuracy if necessary. Deck may run wild.

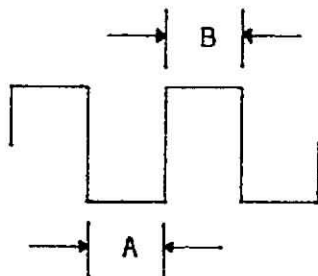
Do not readjust BAL pot for the rest of the alignment procedures.

UNAKI 10

7. Rotate Sensor 1 slightly for maximum amplitude with minimum amplitude variations.

This completes alignment of Sensors 1, 2 and the BAL pot.

8. Connect scope to TP 7. With deck in play mode adjust scope for display of square wave. Adjust SYM pot for symmetry of the square wave.



$$A=B$$

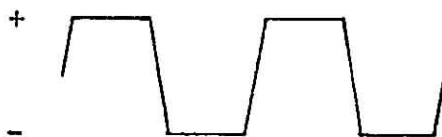
9. Connect scope to TP 5. Adjust scope for positive trigger. Reduce gain and adjust sweep for a display of four pulses. The first pulse should be at the start of the trace. Pulses two and three should be closely spaced together at the center of the screen with the fourth pulse at the far right side.



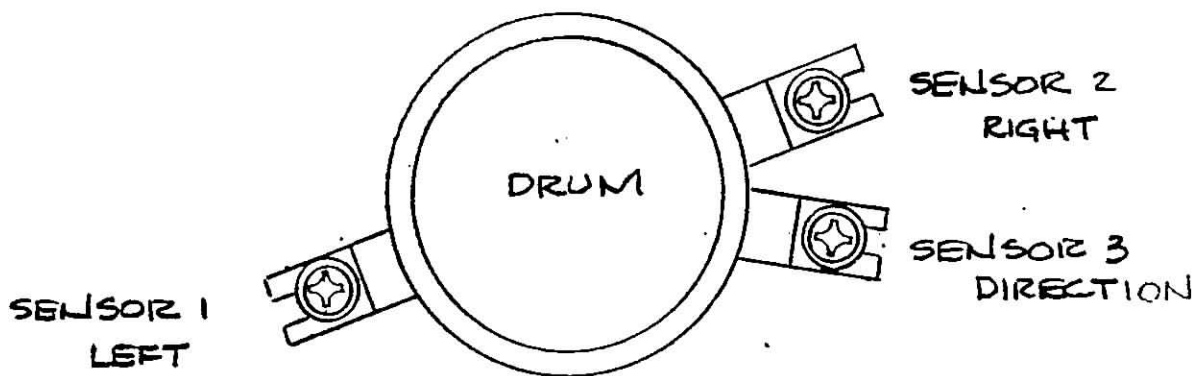
Adjust SYM pot so that pulse two is aligned on top of pulse three.

This completes alignment of the SYM pot.

10. Connect scope to TP 1. With deck in play mode, adjust scope to display waveform. Adjust Sensor 3 for maximum amplitude with minimum amplitude variation. Adjust 90 SYM pot for symmetry of waveform.



11. Connect external trigger of scope to TP 2. With deck in play mode, switch scope to external positive trigger. Adjust trigger for a stable pattern.

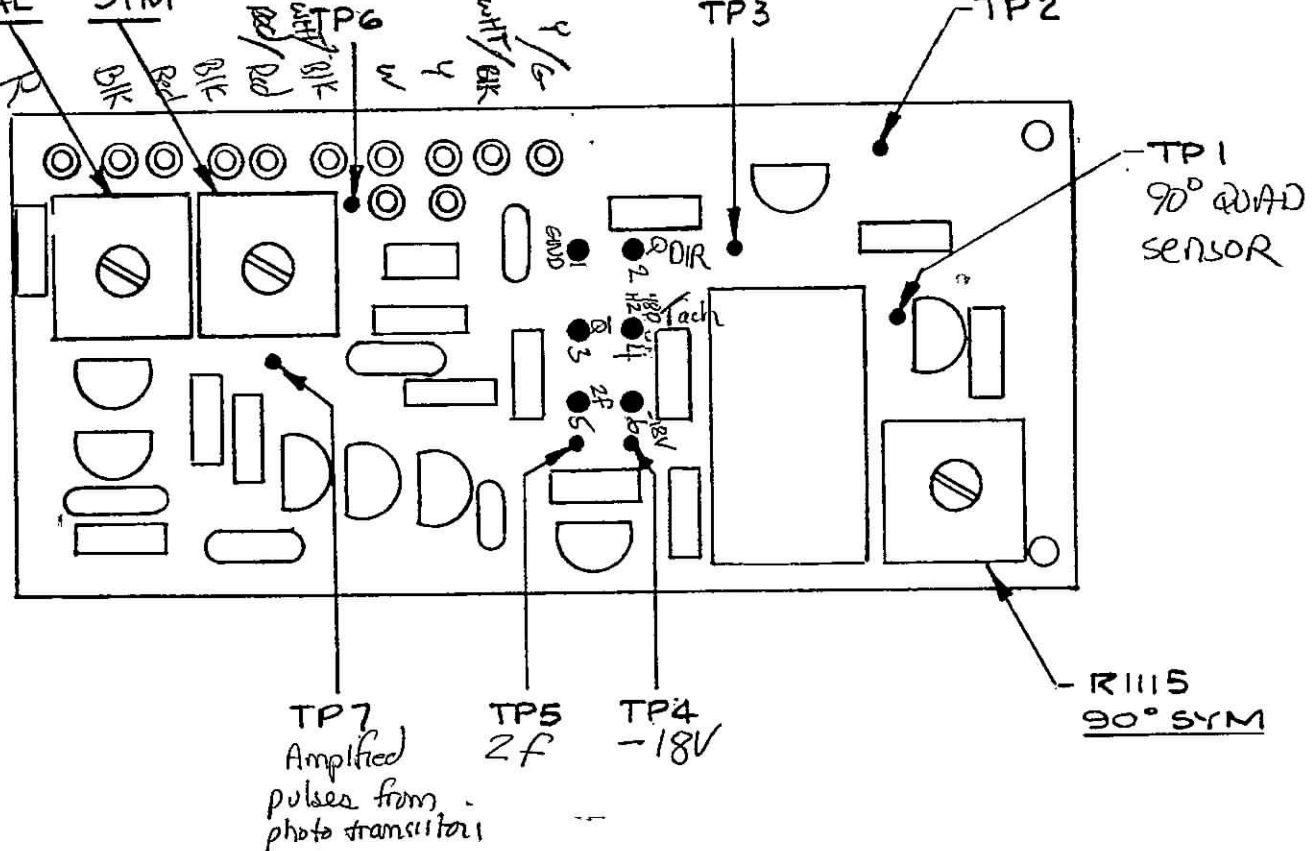


Old | New

White/Black = Cathode Led
Red/Red = Anode

Black/White = collector Phototransistor
Green/Yellow = Emitter

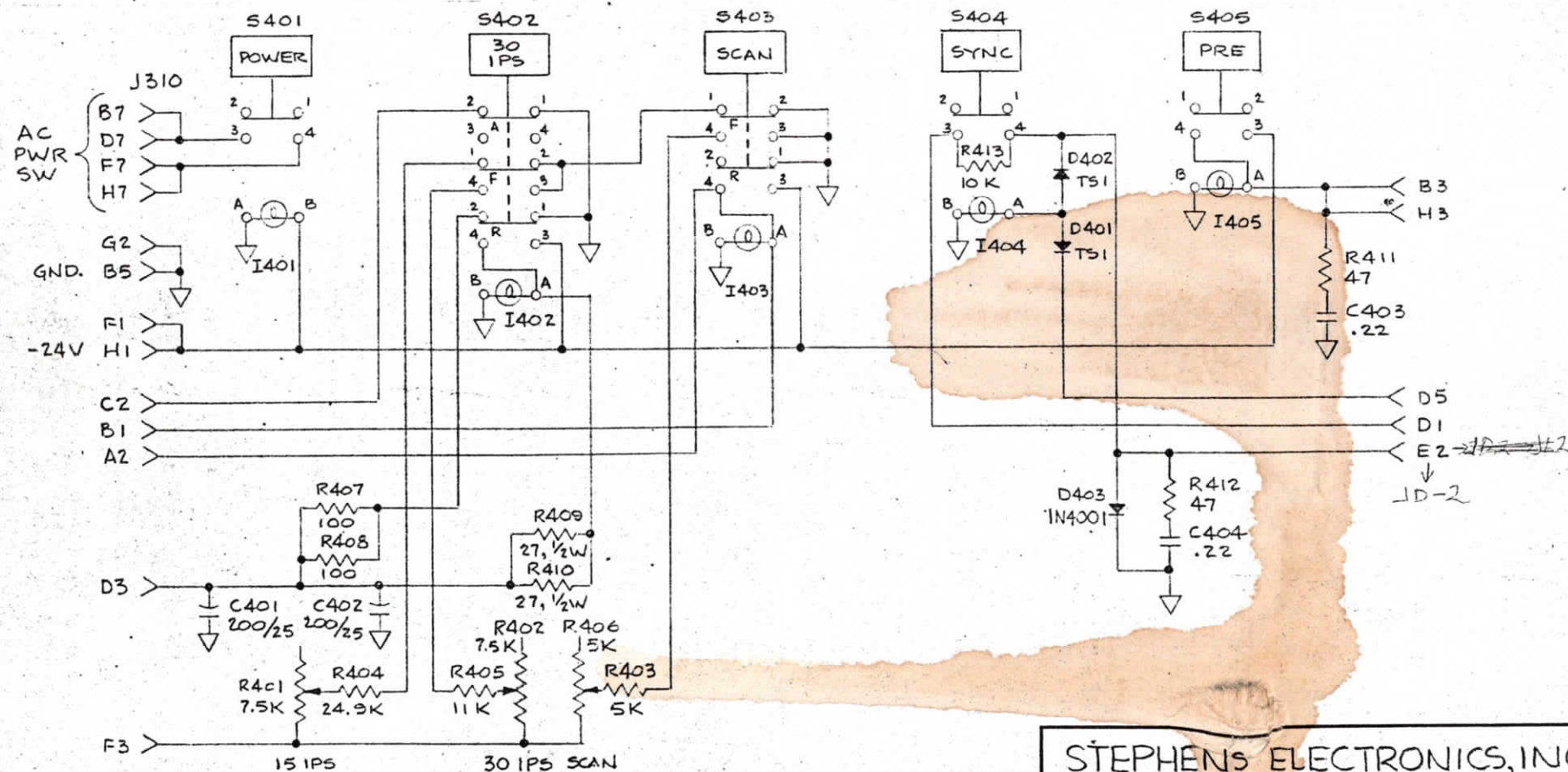
R1103 BAL R1101 SYM



2

3

REVISIONS			
LTR	DESCRIPTION	DATE	BY
	MODEL WAS 821B		



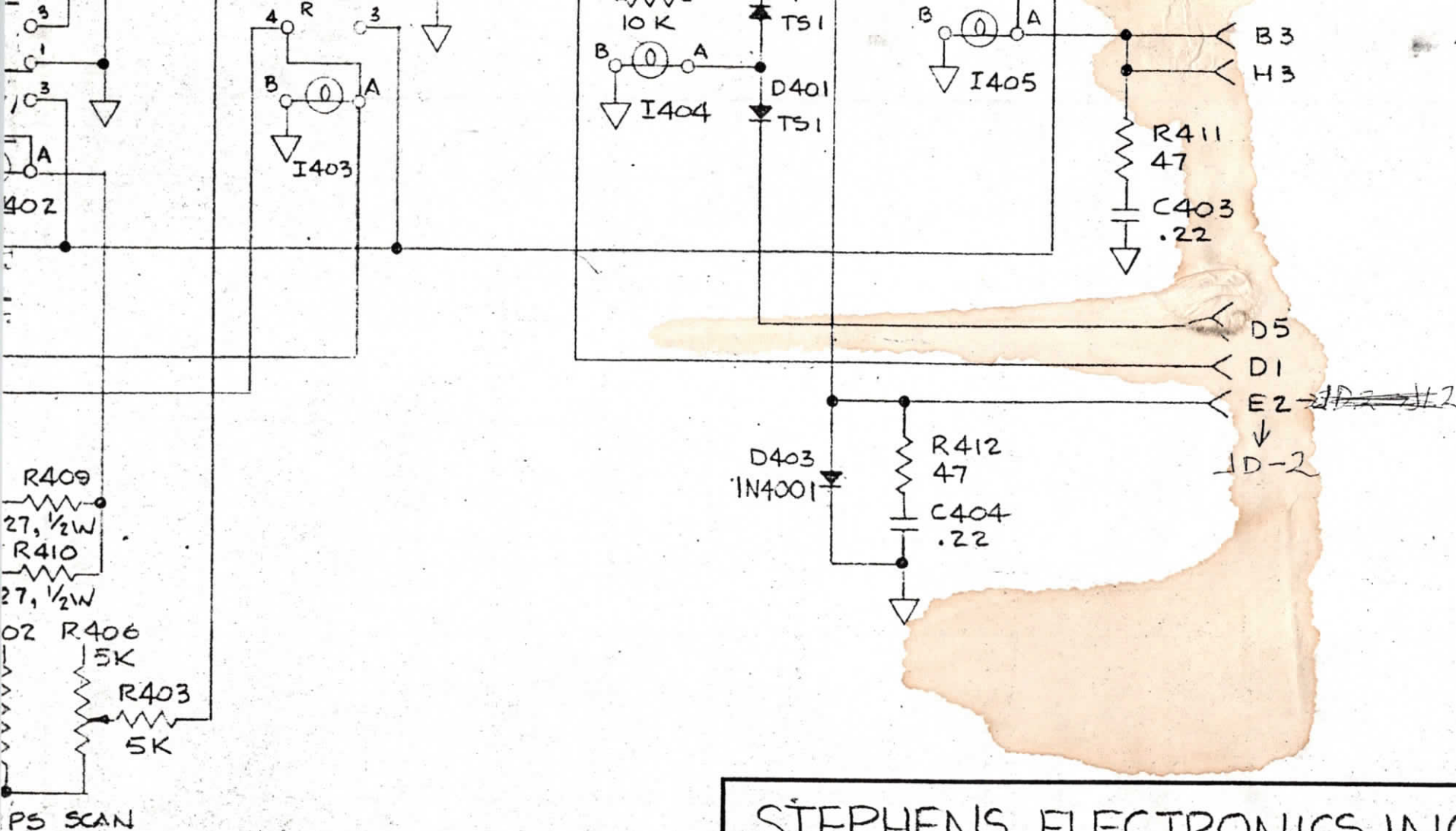
STEPHENS ELECTRONICS, INC.

SCALE: <i>2</i>	APPROVED BY:	DRAWN BY: <i>GEIER</i>
DATE: 27SEP 79		REVISED:

STATIC CONTROLS MODULE

MODEL 103A 104A	FIGURE 6-18	DRAWING NUMBER SC-0401
--------------------	-------------	---------------------------

LAST SYM NO. USED	NOS. OMITTED
C 404	
D 403	
R 413	



STEPHENS ELECTRONICS, INC.

SCALE: \sim

APPROVED BY:

DRAWN BY GEIER

DATE: 27 SEP 79

REVISED

STATIC CONTROLS MODULE

MODEL 103A
104A

FIGURE 6-18

DRAWING NUMBER
SC-0401

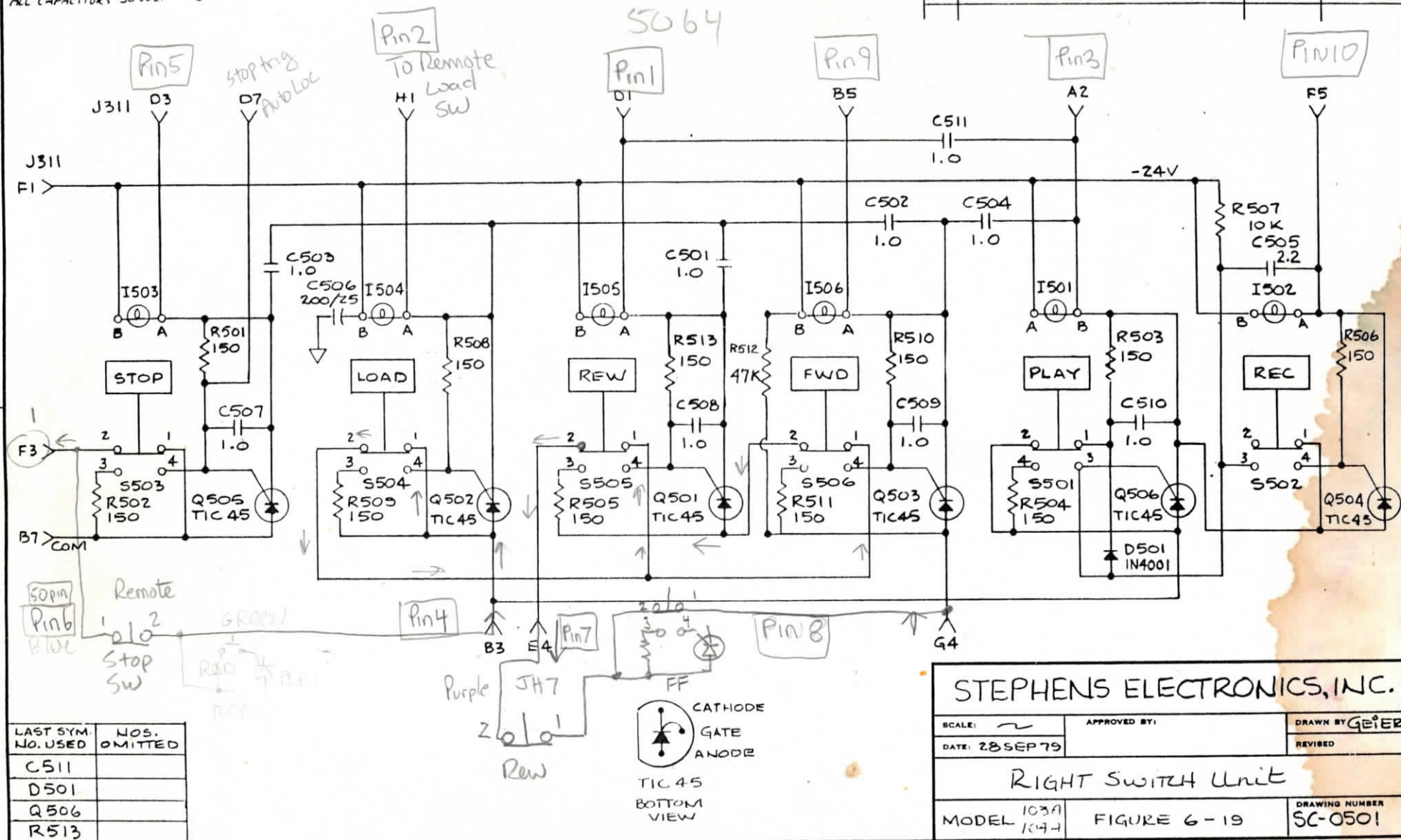
2

1

3

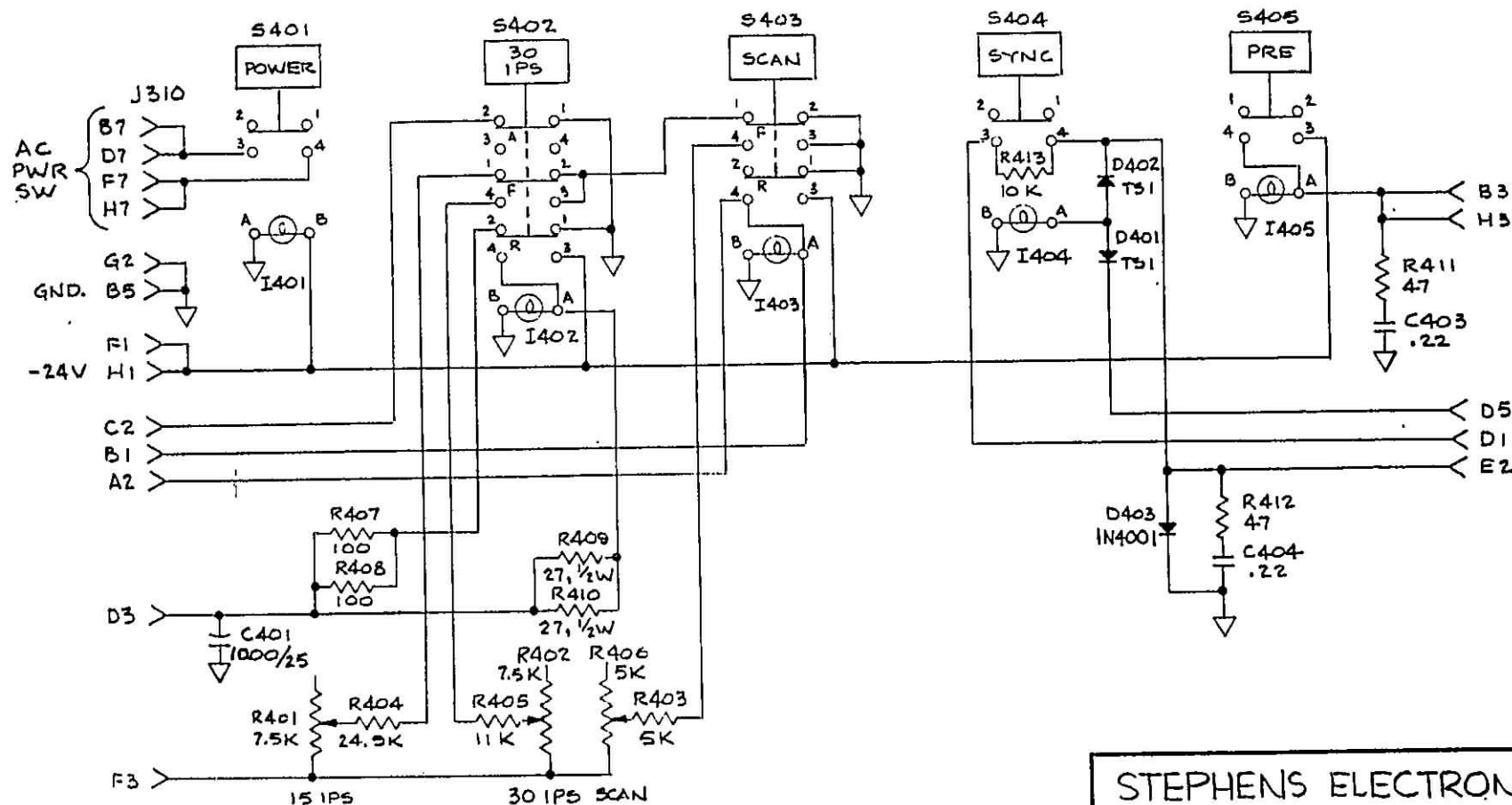
B

12

[illegible]

11E17 PRINTED ON NO. 1000H CLEARPRINT

REVISIONS			
LTR	DESCRIPTION	DATE	BY
A	MODEL WAS 821B, C401 WAS 200/25" REMOVE C402	2-16-82	D. Gioce



LAST SYM NO. USED	NOS. OMITTED
C 404	
D 403	
R 413	

11X17 PRINTED ON NO. 1000H CLEARPRINT

STEPHENS ELECTRONICS, INC.

SCALE:	APPROVED BY:	DRAWN BY: <u>GEIER</u>
DATE: 27 SEP 79		REVISED
LEFT SWITCH Unit		
MODEL 103/1 104A	FIGURE 6-18	DRAWING NUMBER SC-0401A